THE RAILWAY REVIEW

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PREVENTION OF BOILER INCRUSTATION.—An Austrian chemist recommends the following method for the prevention or removal of boiler incrustation, which has furnished remarkably good results during the year that it has been in use at Anina and other localties in Austria-Hungary. To the feed water there is added a mixture consisting of 90 per cent of soluble chromates and 10 per cent of soda. These salts transform the more or less soluble carbonates contained by the water into soluble chromates which settle in the shape of slime without adhering to the walls of the boiler, and the latter can easily be cleaned by washing. The beneficial effect of the process will be felt even in the case of boilers which are already lined with thick layers of incrustation, for these will be gradually reduced and transformed into slime. On an average one-tenth of an ounce of the mixture should be added to 35 cu. ft. of water. For an ordinary boiler 3 to 4 oz. per day would be sufficient. Where water with very high lime contents is being used, the dose should be increased a little; the exact quantity needed can easily be determined by a preliminary test.

LONG TIMBER.—The tallest trees are to be found in the state forest of Victoria, Australia. They belong to the eucalyptus family and range from 350 to 500 ft. in hight. One of them that had fallen was found by measurement with a tape to be 438 ft. from the roots to where the trunk had broken off by the fall. At that point the tree was 3 ft. in diameter. The tree grows with astonishing rapidity. A *eucalyptus globulus* planted in Florida grew 40 ft. in four years, with a bole a foot in diameter. Trees of the same species in Guatemala grew 120 ft. in twelve years. The stem of one was 9 ft. thick. Piles from 100 to 105 ft. long are being used by the Tacoma Land Company of Tacoma, Wash., in replacing a portion of its sea wall with a pile and stringer wharf. The water is 30 ft. deep and the outer row of piles range from 100 to 105 ft. in length, 10 in. in diameter at the tip and 22 in. at the butt. The piles are made from the "Washington fir" (the Douglas pine) and from the same timber a few piles were cut and recently used, 120 ft. long and 24 in. at the butt. Sticks 90 ft. long, three car lengths, in squared timber are often shipped east and it is expected that changes in the alignment of the railway will soon permit the shipping of 100 ft. lengths.

ACETYLENE MOTOR CAR.—Some small cars propelled by motors driven by acetylene gas have lately been constructed in Italy. The charge consists of acetylene gas dissolved in fifteen times its volume of air, and with this mixture it has been found unnecessary to use water for cooling the cylinders. The method of igniting the charge has not, however, been made known. According to the Gastechniker, the motors maintain a speed of 600 revolutions throughout a working period of 15 hours. The weight is only about 20 lbs.; and 0.8 brake horse power is developed. The cost of working is said to be about 0.6d. per hour.

EARLY IRON BRIDGES.—The early iron bridges of the New York Central Railroad have been referred to a number of times of late, in discussions on the strength of such structures, as being remarkably good types of iron work, particularly when their age is considered. Mr. George E. Gray, now first vice president of the Wells-Fargo Company, was the chief engineer of the railroad at the time they were built, and contributes to the last number of the "Proceedings of the American Society of Civil Engineers" a number of interesting historical notes concerning them. All the parts were connected by riveting, thus diffusing the strain throughout the whole structure. The advantage of this system was soon illustrated at a bridge of this type just erected over the Erie canal near Newark, N.J. As a fast express train approached within a few feet of this bridge, the axle of the forward driving wheel broke off close to one wheel. This left the wheel free, which was propelled forward with great velocity, striking in its course the second outside post on that side, cutting the post off entirely, together with several tension bars. Moreover, the third and fourth posts were nearly severed, and several tension bars more or less cut away, but the rigid connection of the structure enabled the train to pass over safely, and, in fact, there was no delay in passing all other trains while repairing the damage. The bridge was designed and built before 1864. Mr. Gray believed that this company was the first to build an all wrought iron bridge of any considerable span for railroad use in the United States. Several combination bridges of cast and wrought iron, had been constructed, but the failure of one of them on the New York & Erie road, through the ignorance of the trackmen, caused railroad officials to look with distrust on any iron bridge. The history of the introduction of structures entirely of wrought iron is decidedly interesting, and is similar in certain respects to the history of the change from wrought iron to steel. Mr. Gray, as chief engineer of the New York Central Railroad Company was directed to examine carefully into the subject of iron bridges and report to its board of directors. The high price of iron and the general lack of knowledge of its use for such purposes made it difficult to get a reasonable consideration of the subject by those high in authority. In working out the plans and train sheets a serious question arose as to how much a given section would bear under compression without bending. Upon this question the highest authority then accessible was silent, and it was necessary to solve it by erecting the proper testing machinery for that purpose at the company's shops at Albany. Finally when authority was obtained and plans and estimates prepared, the directors and officials were skeptical. To convince these people a single track bridge of 30 ft. span, proportioned to one ton per linear foot was built at Schenectady solely for tests. A 28 to 30 ton locomotive, the heaviest then on the road, was run over the bridge at a high speed without any defects appearing. Thereafter the bridge was loaded by dead weight, evenly distributed, to over four tons per linear foot, when it failed from a defective tension bar. This load was four times that then used in computing the parts of bridges.

THE COMMERCIAL NAVIES OF THE WORLD.—The latest edition of the "Repertoire General de la Marine Marchande," published by the Bureau Veritas," contains the usual general summary of the steamships belonging to the different maritime nations, and measuring 100 tons gross and upwards, as also the accustomed list of sailing vessels measuring 50 tons net and upwards, and likewise a list of the smaller vessels which are classed in the Veritas Register. The following table shows the number of steamers of over 100 tons, and the collective gross tonnage belonging to the sixteen principal maritime nations—that is, whose aggregate gross steam tonnage surpasses 100,000 tons.

	Steamers, 1896.	Gross tons, 1896.
Great Britain and Colonies	5,690	10,245,577
Germany	831	1,360,472
France	532	933,244
United States	477	761,707
Spain	365	519,315
Norway	551	494,612
Italy	222	344,523
Holland	204	320,794
Japan	267	313,563
Russia	314	277,302
Austria-Hungary	156	254,269
Denmark	265	248,773
Sweden	427	233,777
Greece	107	144,975
Brazil	314	139,305
Belgium	66	139,300

Besides the steam tonnage set forth in the above table, there are 2,667 small steamers (below 100 tons), measuring altogether 415,069 tons gross. The number of existing steamers whose measurement is between 5,000 and 6,000 tons is 131; between 6 000 and 8,000 tons, 59; those over 8,000 tons, 25, and of these eight are of more than 10,000 tonnage—viz., the Campania, Friedrich der Grosse, Georgic, Lucania, New York, Paris, St. Louis and St. Paul. The general total of the steamers of over 100 tons is given in the Repertoire as 11,155, representing 17,089,596 tons gross, and 10,761,025 tons net. The sailing tonnage is divided among the principal maritime nations as follows—thirteen nations possessing sailing tonnage of over 100,000 tons:

	Ships, 1896.	Net tons, 1896.
Great Britain and Colonies	8,726	3,267,625
United States	3,881	1,358,467
Norway	2,801	1,176,174
Germany	1,096	566,973
Italy	1,692	472,002
Russia	1,753	363,046
Sweden	1,444	285,665
France	1,425	252,940
Greece	1,059	246,196
Turkey	1,247	241,096
Spain	1,115	167,143
Denmark	795	149,843
Holland	642	139,649

THE WHEAT SITUATION.—Secretary Morton reports that the European agent of the Agricultural Department advises that the advance in wheat values is expected to result in increase in wheat area, though up to the beginning of the last week in October the wet weather prevented sowing, and the season up to that time was noticeably backward. Since then it has been favorable for farm-work, and if it continues as much so throughout November wheat sowing will be materially increased. On the 21st of October the highest ranges of prices for the month was reached, and London quotations for that day are given below, with a comparison of last year's prices. The general advance in wheat in 1895 may be put down at 15 cents per bushel, and a further equal advance has been made this year. The statistical position is such that the grain trade of London and Liverpool expects prices to be fairly maintained through the winter and anticipates active business. Flour has moved in sympathy with wheat and the price of bread has been generally advanced in London and throughout the country.

Wheat and Flour.	Oct. 21, 1896.	Oct. 21, 1895.
Finest English wheat per bushel of 65 lbs	$1.21	*
Fine English wheat per bushel of 63 lbs	1.09	$ .91
Ordinary English wheat per bushel of 60 lbs	.94	.79
Odessa Ghirka wheat, per bushel of 62 lbs	1.03	.73
Azima wheat, per bushel of 62 lbs	1.00	.76
Hard Taganrog wheat, per bushel of 62 lbs	.94	.64
California wheat, per bushel of 63 lbs	1.12	.79
American spring wheat, per bushel of 62 lbs	1.09	.76
American winter wheat, per bushel of 62 lbs	1.09	.76
Persian wheat, per bushel of 60 lbs	.91	.64
Best English flour, per sack of 280 lbs	7.75	6.07
Best American flour, per sack of 280 lbs	6.56	5.34
Common English flour, per sack of 280 lbs	6.07	4.86
Common American flour, per sack of 280 lbs	5.59	4.13

*Not quoted.

THE ROCKEFELLER MINING SUITS.—The United States circuit court of appeals at St. Louis has reversed the judgment which Alfred Merritt obtained in the Minnesota court against John D. Rockefeller for $940,000. Merritt and some of his relatives owned mining properties on the Mesaba range. In 1893 they made an arrangement with Mr. Rockefeller to put his and their properties together in consolidation. Some time after the trade was made Merritt became dissatisfied and brought suit against Rockefeller on the ground that the latter, by his agent, had misrepresented the value of his properties. Merritt recovered a judgment for $940,000. The suit and verdict attracted wide attention, as also did an attempt to attach Mr. Rockefeller's property elsewhere in satisfaction of the judgment. This judgment is reversed on the ground that there was no deception, and that the property was not improperly valued.

THE SOUTH (JETTY) PASS IN DANGER OF FILLING UP.—According to the New Orleans Times-Democrat the Mississippi jetties are in danger of becoming inefficient from the existence of a crevasse 3,000 ft. wide, leading from Pass a l'Outre to Garden Island Bay and to the gulf. The South Pass, the one opened by the jetties, lies between the Pass a l'Outre and the South West Pass, and Mr. Eads laid mattresses across the mouths of both of the other passes to divert the water towards the center pass and to keep up the scour in that channel. But the mattress across the end of the Pass a l'Outre has been broken by floods and a deep channel formed at the mouth which leads a large volume of water into the northern arm of the delta. A crevasse has also been formed in the south bank, about 1½ miles below the head of the pass, and by making a shorter route for the water and decreasing the fall, it is estimated that about 52 per cent of the volume of the river water now empties into the gulf by this north channel and 25 per cent goes through the crevasse. The output decreases the flow in the South Pass and it is said to be growing shoaler and narrower at an alarming rate. The crevasse occurred in 1891 and there is now a gap 1,200 ft. wide and 84 ft. deep between the end of the Pass a l'Outre mattress and the South Pass works. The executors of Mr. Eads, at their own expense, attempted twice to close this gap, but without success. Major B. M. Harrod, of the Mississippi River Commission, says that the crevasse at Pass a l'Outre should be closed at once. But it must be done by the government, under a special congressional appropriation, as there is nothing in the Eads contract compelling them to perform this work. Major Harrod favors the immediate improvement of the South West Pass, which is now deeper than the South Pass, when work was commenced upon it, for it has 12 to 14 ft. over the bar, as compared with 8 or 9 ft. in the original South Pass. The necessity for speedy action by the government is made more apparent by the fact that the Eads contract expires in July, 1899, and something must be done, either to preserve the channel at the South Pass, or to secure a wider and deeper entrance at the South West Pass.

THE EXACT STATUS OF THE TRANS-SIBERIAN RAILWAY.—A Russian military writer gives a summary of the work actually accomplished on the Trans-Siberian Railway up to a recent date. The permanent way has now been laid over a distance of 5,250 miles. The western Siberia section is in working order both for passengers and for goods traffic, but the bridges across the Irtish and Obi are not yet completely finished. Those streams have still to be crossed in winter by sledges over the ice, in summer by means of ferry boats. The Cheliabinsk-Ekaterinburg branch was opened in the year 1895, but along it only provisional wooden bridges had then been constructed. These are now about to be superseded by iron bridges. In central Siberia only the short section from the Obi to Bolotna—80 miles—is working, but that from Bolotna to Krasnoiarsk is approaching completion, all the bridges east of the Obi being still temporary wooden ones. The iron bridge over the the Yai is finished, but at least another year will elapse before the 1,100 miles of railway through central Siberia will be finished. Beyond Irkutsk, in the next section—that is to say, to Listvinitchna—the preliminary surveys have not yet been completed. In the Baikal basin nothing has been done beyond constructing an immense dyke, which is not yet finished. The preparatory works for the 400 miles in the Amur region are on the point of completion. There are many natural difficulties along this route, and at least one long tunnel will have to be constructed. In the Lower Ussuri about 250 miles of the railway have been constructed. This is the section between Vladivostok and Grafska and from Grafska itself there is a short line of seven or eight miles to Iman, on the banks of the Ussuri itself. In the Upper Ussuri work is in active progress, with a view to an early linking of the lines as far as Khabarovka. The present official view of the date for the completion of the line is that unbroken railway communication will exist between St. Petersburg and Vladivostok by the first day of the new century.

Civil Engineers' Club of Cleveland.

The November meeting of the club was held in the rooms of the School Council, Public Library building, Tuesday evening, November 10, 1896. Present, 52 members and visitors. Mr. Hyde reported, at the request of the chairman, in regard to the progress of the proposed amalgamation of the technical societies of this city. The paper of the evening was read by Joseph R. Oldham, N. A. and M. E., on "Structural Strength of Ships and Improved Arrangements for Repairing without Diminution of Strength." Mr. Oldham's paper treated of matters under the following heads: Progression by steps in engineering; increase in steel lake tonnage; bending moment and shearing stress; strength of beams and girders; straining of ships; improved hatches; useful weak ships; joggling and lapping; flush bottoms; heavy ships; light ships; a perfect mechanical structure. Messrs. Newman

Searles and Head followed in an interesting discussion. Mr. Alfred H. Raynal was reported as unanimously elected to active membership.

CAR HEATING BY STEAM.

A paper read by Mr. R. M. Dixon before the New York Railroad Club was reproduced in the RAILWAY REVIEW of October 24, 1896, and an abstract of the discussion is given as follows:

Mr. Gold (Gold Car Heating Co.)—The perfection of a steam-heating apparatus, in my mind, would be to have the cars equipped in such a manner as would produce a comfortable temperature and to have all parts and appliances which are used to produce such result, by whatever system it may be (whether it is storage, or direct steam, or a hot-water circulating apparatus), as near automatic as possible. There should be no reason why cars cut out of trains should have pipes freeze on account of inattention or neglect of trainmen. It should not be necessary to have the trainmen open any drainage valves whatever, for with an efficient heating system to which traps are connected the condensation will be released automatically.

When steam-heating first came into use for warming passenger cars it was the usual custom to use a three-way cock on the train pipe, and when this was found to be an objectionable device, owing to its leaking and freezing the pipes, and also on account of its sticking and being difficult to handle and adjust, some few roads then substituted two straight-way cocks and took the steam supply from a point between the two cocks. This, too, has been found objectionable, because, although two straight-way cocks will keep tight a little longer than a three-way cock, still they will surely leak in a short time and give the same trouble as the old three-way cock; besides, they are known to tick tighter. It is almost impossible to repair a cock when it gets out of order, and generally when trouble occurs they have to be replaced; consequently, in using two straight-way cocks there is twice the cost for maintenance that there is with one cock, and very considerably more than when a train valve is used. All train-pipe valves should, of course, be left open, and the one in the rear car closed tightly; because, a train-pipe valve being automatic and having a trap attached, it will itself release the condensation and allow as free a circulation of steam in the last car as in the first. I deem it inadvisable to have a man open the cock of the rear car, because he is liable to open it too much and waste considerable steam, or, if he does not open it enough, the condensed steam moving slowly is very liable to freeze the pipes at the end of the car.

To substantiate my assertion that steam traps are not only necessary and desirable, but also one of the best features of a steam-heating apparatus, I will say, that not only are many thousand cars on several of the leading railroads in this country equipped with traps, but every car which has thus far been fitted with steam heat in Great Britain, as well as many more on the Continent of Europe, are also fitted with traps and every one giving entire satisfaction. I am aware that there is some prejudice against the use of traps, and perhaps justly so, because at the time when the steam-heating of railroad trains was in its infancy many traps of inferior merit were put on the market, and the dissatisfaction caused by their not working properly has given a bad impression on the subject of steam traps, but this feeling seems now to be fast disappearing. With a trap the discharge of condensation is taken care of automatically and completely, and a trap is, therefore, in my judgment, far better than a drip valve. I believe that the best results to be obtained in car-heating can be had by the use of a straight steam storage system, with the mechanical construction of which I presume, most of the gentlemen present are familiar.

Mr. Mitchell (Erie Railroad)—On the Erie Railroad we made an exhaustive series of tests to demonstrate how much steam was required per car in a train. We found on the first three cars it required about 4 lbs. to each car. We found after that you should add about 5 lbs. additional per car for about five or six cars, and then you would have to increase the pressure about 7 lbs. per car for the balance of the train. We found that the steam would not go through 20 cars with less than 80 lbs. of steam. We therefore set the pressure to be carried on our trains as follows: The pressure should not exceed 50 lbs. on the locomotive and train pipe unless called for by the conductor, in which case the pressure could be run up to 75 lbs., beyond which our safety valves on the train pipe in the engineer's cab would not permit.

We use two train pipe valves. We place our steam pipes, well fitted, between the deafening ceiling and floor, so that the pipe is not exposed. It is then covered with asbestos and mineral wool. We formerly placed the train pipe valves in the center of the coach, but found that when the valves broke it cost us a good deal of money to repair; but two years ago we introduced the practice that every time a valve broke we would apply the train pipe valve under each platform with a stem coming up through the platform floor, so that it could be operated from the platform by an extension on the top end of the valve. By this means we have overcome a great deal of the cost of repairs, and we have found that two train pipe valves are better than one three-way cock, located inside of the car, on account of the readiness with which it can be repaired. We also found, after two years experience with an experimental train pipe valve, that a 1-16 in. hole drilled through the plug in such a way that when the valve was closed live steam would blow out through the 1-16 in hole into the atmosphere, would allow sufficient escape to prevent any condensation from freezing between the last train pipe valve and the rear end. With this arrangement we have reduced the cost of maintenance very materially, and have also simplified the care of the rear train pipe valve by the trainman. They do not have to change it after it is once started.

We have been using steam heat about 8 years. During that time we have had cars freeze up, have had no end of trouble; in fact, have had the usual experience; but about five years ago we went into the subject very carefully after having seven or eight cars freeze up, to ascertain the cause and see if we could not introduce some remedies or rules to prevent such occurrences. After looking into the question thoroughly we introduced the rule upon trains approaching division terminals where engines are to be changed, or division terminals where the train is to be put away, that ten minutes before reaching such terminal the trainman should go through the train and fully open every supply valve; that five minutes before arriving time the rear train pipe valve should be fully opened. As soon as the rear train pipe valve is opened wide, the engineer immediately notices on the train pipe gage that the steam pressure has fallen, and he leaves the steam on the train pipe for about two minutes, when he closes the main valve on the engine, not disturbing the reducing valve. Since these rules have been in effect we have reduced our trouble to a minimum. I would further add that just before the train gets to the terminal, after the train pipe is blown out, the trainman also opens the blow off cock in the trap and relieves all the traps from water. We have stationary heating plants at our terminals; hence, we do not allow a coach to become cool, unless it it goes to the shops for repairs. I might add, in relation to traps, I am a firm believer in traps under the cars. The traps save a great deal of trouble, and I believe in a great measure prevent freezing of train pipes, and also prevent an excessive heating of the trains. Without traps the trainman always keep the temperature too high for fear the pipes will freeze up.

Mr. Morris (Chesapeake & Ohio Railroad)—The Chesapeake & Ohio I do not believe had a failure of steam heat last winter, with the exception of when the cars were in a very severe blizzard in the north, and became disconnected everywhere and anywhere, and there was no attention given to the heating system; but on our own road proper, we did not have a failure. We have at all terminals arrangements for heating the cars when detached from the engine. We have no less than six or seven systems on our road. I heard one of the gentlemen allude to the practice of railroads putting on $1.50 men on pipe work. I have been with a good many railroads myself, but I have failed ever to find a man to work for $1.50 per day that could put steam heat properly in a car. We use the best pipe men we can find and pay them about $2.50 per day and still we have a little trouble with the steam heat, principally from the exit of condensation from the traps, in their present form, permitting the condensation to accumulate on the outside of the cars, and very frequently the water, from leaks, will follow the frame of the car and get into the sheathing and blister the paint.

Now, we cannot throw away systems that use traps. We started in with the infancy of steam heat, and we have spent a great many thousand dollars bringing it up to what it is. I wish there was some way to get rid of traps. In our present system we have tried a great many different kinds of traps and found the best ones we could use are objectionable on account of allowing any steam or condensation to escape. I have tried a number of thermostats, without very satisfactory results, and find that a small hole drilled through the valve is a very good thing. The opening is never forgotten. But, as I remarked, the most successful train-heating that I have had any experience with has resulted from the trainmen being properly instructed and disciplined to watch the system, and having the proper repairs made to any system when the car comes in. We are putting a great many of our train-pipes now below the sheating, and jacketing them with asbestos, and covering them with a sheet-iron cover to protect the cloth, and we find from that location the leaks are more readily discovered and corrected.

Mr. Higgins (Lehigh Valley Railroad)—I agree with Mr. Dixon that the trap is not necessary, but I think a trap is desirable, and one reason why to-day some persons are opposed to traps is because we have not had very many good traps. The traps we have used have not done their work as they should have done it. They have been in many cases failures. It seems to me, in connection with the trap matter there is one point that has been overlooked and that is whether or not the trap would effect any saving in the coal pile. I propose this winter to find that out by running a train with drip valves, and then taking the same number of cars with traps, making the conditions the same, and find out whether there would be any difference in the consumption of coal or not.

The President—I think the members would like to know what pressure Mr. Morris uses on his trains. The conditions under which buildings and trains of cars are heated are very different, and I do not think these proceedings ought to go out with the understanding that it is possible to heat cars with 1 and 5 pounds of steam pressure.

Mr. Morris—The length of the train, of course, makes a great deal of difference. Our through trains have a maximum of ten cars, in the winter nothing over nine, in the spring and fall we frequently have ten cars; but we never use over 40 pounds pressure, and after an engine has been changed and 40 pounds pressure has been put back, we reduce that to 25 and carry 25 pounds over the road with ten cars. With less cars we use less pressure. We have direct steam in the baggage cars, and hot water in the other cars. This is the Safety Car Heating & Lighting Company's system that we have in the coaches, and the Sewall drum and McElroy commingler. We have them all connected in the same trains. I do not think the system cuts any figure. The radiating surface in the cars does the work. The practice on our road is almost the same as with Mr. Mitchell. It allows in an emergency 75 pounds pressure to be applied, but as a rule we get along with 40 pounds, with a limit of 75 pounds; but this latter is only for extraordinary cases of emergency.

Mr. Mitchell—About six years ago our purchasing agent asked me to make tests of several different makes of hose and ascertain which was the best. I had samples sent me and put them on the engines running on regular trains. I found that each one of these hose failed from chafing, and I told the purchasing agent that I did not know which was the best, that they had worn out from contact with the other hose, and if he would send me another lot I would try to find out which was the best. I made up my mind that if chafing was to be the test of hose in service I would make a shop test. I rigged up a rubbing machine to rub one hose against the other, under a pressure of 70 lbs. of air. I set the machine going and found that the chafing life of the hose varied from two hours in one case to twenty hours in another, so I reported to the purchasing agent the twenty hour hose was the best and the two hours the poorest, and we continued to purchase hose on this test. Later on I found that this test was not worth so much as the guarantee of the manufacturers for two years, and therefore we have abandoned the chafing test on our road.

Mr. Culver (New York, Ontario & Western Railroad)—We carry on our road from about 40 to 50 lbs. pressure usually in cold weather. We use nothing but the common globe for a drip valve. We have two cars with automatic drips on, which we find are very good. We shut off the cock on the front end of the train on approaching a station where we change engines, and hold the steam all on the train, which we find is a very good thing to do, as we do not take so much steam from the engine again in charging the train pipe. Then we open the train pipe valve, which carries off the condensation. We have never had any trouble with condensed water in the pipes.

Mr. Hayward (Pennsylvania Railroad)—The system in use on the Pennsylvania Railroad is the return system, and in our service in moderate weather we heat our trains almost entirely with exhaust steam, having an air pump on the engine to produce a vacuum in the return pipe. I think in severe weather we rarely exceed 10 lbs. pressure, and generally work in moderately cold weather with 5 lbs. pressure, depending upon the length of the train. Of course, the return system is somewhat more expensive than the direct system. The pumps are an additional expense, and the principal trouble we have had is from the pump valve stems breaking; but otherwise we consider it a very successful and an economical system of heating trains, on account of requiring so much less steam from our engines.

Mr. Mitchell—For local trains where the passengers are only going to be in the cars a few miles, the direct steam is the proper thing, but on through cars I believe in the hot water system. You get a more uniform temperature with the hot water system, you can control it better, and you do not burn the feet of passengers. You have less than boiling water temperature in the one case, and in the other about 212 degrees plus steam pressure; hence I believe that the hot water circulating system gives better service for through trains.

There is one thing very important in the water circulating system of heating. Almost all of the sleeping cars and a great many of the coaches running to-day have the Baker heater system of water circulation, where the pipes are filled with water, and when you try to get circulation you often fail to get it on one side of the car, while you get it on the other, and this, in my judgment, is caused by a pocket of air accumulating in the cross-over pipes, which compresses as the pressure increases, but sufficient pressure is not obtained to move the water on the other side. This trouble was overcome several years ago by Mr. Geo. H. Johnson, general foreman in our Jersey City shop. He decided he would work on a different scheme than formerly, and not fill the pipes with cold salt water directly from the barrel, so he opened the four blow-off cocks in the Baker system and attached a steam hose to one of them. As soon as the steam would blow out of one valve he would close it, then the next and the next, after which the steam would blow out of the expansion drum; then by attaching a pipe to same, and passing its open end into a barrel of salt water, the steam would soon heat it up and expel all the air, after which the valve at steam connection is closed; and as the steam condenses, it forms a vacuum in the pipes and lifts the water and fills the pipes with water free from air, which insures freedom from trouble, as mentioned previously.

Mr. Summers (West Shore Railroad)—With regard to the hot water system, we find trouble with the water not heating by reason of the pipes not being thoroughly cleaned out. We blow the steam out through the stop cocks, and then after all pipes have cooled off thoroughly (we do not do it without giving ample time to get cold) we do just the same as washing out a boiler. We apply cold water with a pressure of 75 or 80 lbs., as we have the pressure at Weehawken, and go through the very same performance with the water that Mr. Mitchell describes with the steam, allowing the water to run until it is as clear as any spring water. I have washed out cars where I thought the dirt would never stop running. It ran as black as ink for 30 minutes. It would not seem possible that so much dirt could accumulate in the pipes.

Mr. McElroy.—In regard to the question of pounding experienced in connection with systems connected with the Baker heater, I am of the impression that pounding has been due to the fact that when the steam is applied in a drum it causes the temperature of the water within the pipe in the drum to rise to the boiling point and free steam is generated. Now, the question as to whether that drum will pound depends on which end of that pipe the displaced steam that is formed will leave the drum. If it goes out at the hot end there is no sound; but if it

goes back to the cold end, the inflowing end, where the water is cold, then you are sure to get the pound.

As to the cause of the Baker heater at times not circulating properly, to which reference has been made, I find that is due largely to the generation of pressure in the expansion drum, pressure on the whole circulating system, due to the fact that when the drum is filled full to its middle point with cold water, and the water is heated and expanded, the air is compressed in the upper part of the drum, and in the great majority of cases it is due to pressure alone; and if you take a car with which you have that difficulty, and at once proceed to the expansion drum and let that pressure off, a car that has stood for hours and not circulated, will not stand for 20 minutes without taking a complete circulation. Another cause I have found. Salt water is used in the Baker heater pipes. Salt water has a strong affinity for iron. Oxide of iron is formed and hydrogen gas is thrown off, and that is what causes the dirt in those pipes. The water would have remained clear if it were not for the decomposition of the iron pipes that is taking place and the dirt coming from those pipes is oxide of iron. Hydrogen gas has been formed and the pipes are partly filled with it, and the circulation is hindered. If you test that with a candle, as some men have done to their sorrow, an explosion is apt to take place, and in some cases I have known men to be knocked clear off the car from the explosion of hydrogen gas whilst inspecting the condition of the water in the system.

In regard to thermostatic traps, I will say very frankly that I am not a believer in thermostatic traps, especially I am not a believer in them for live steam cars. The function of a thermostatic trap is simply to vary an opening; but the amount of the opening is a very uncertain one. The thermostatic trap is a device, so far as I have been able to determine by experiments, that a similar temperature will not give the same discharge under the same conditions. It will for a time, but it gradually changes. As it changes it requires readjustment, and you have the uncertainty of the man who does the readjusting. A more reliable apparatus is made in the form of a valve having a predetermined opening, an opening made with the valve itself, and so arranged that that will give you about the average discharge you wish; and then, whenever you want to blow out your pipes, you simply raise the seat of the valve and let the steam and water discharge through it freely.

HYDRAULIC VS. STEAM AND AIR RIVETING.

There has been a growing tendency toward the use of higher boiler pressures upon locomotives since the advent of the compound locomotive, which has not in all cases proved satisfactory in practice owing to the leaking of boilers. An explanation for the trouble was offered in the recent discussion of the subject of higher pressures before the Northwest Railway Club, which is referred to in the editorial columns of this issue. The use of hydraulic riveting machines seems to have solved the question of leaking seams and in order to obtain the opinions of locomotive builders upon the relative values of steam, air and hydraulic riveting, a request for information was sent to two prominent building concerns which brought out statements which are quoted from the letters received. It is interesting to note that the first of these builders regards hydraulic machines as being cheaper than those using steam, and that the other one found difficulty in getting uniformity in the work owing to variations in the steam pressure. The letters are as follows:

"Until two years ago we were using the latest improved steam riveters for all of our boiler work. On the introduction of our hydraulic flanging plant, however, we changed our steam riveters by the application of hydraulic cylinders. We find that we are securing much more satisfactory results from the rivets driven by the hydraulic riveters than those driven by steam. This has been noticeable, especially in high pressure boiler work. We also find that the cost of power for operating hydraulic riveters is less, as with the 42 in. steam cylinders there was excessive condensation of steam.

"These works adopted hydraulic riveting a number of years ago on account of there being less chance for bad work by using this power. When we used two steam riveters we had an endless amount of trouble with leaky valves and leaky pistons. The crystalizing of rivets also was so serious that a head when knocked off from a rivet would be very badly crystalized, so much so that it would have the appearance of cast iron rather than of a good quality of wrought iron. Since abandoning steam we have used three hydraulic riveters, two with six feet gap and one with seventeen feet gap, and we find that we have done away with all crystalization and the other troubles mentioned by pressing the rivet instead of hitting it a blow. We carry 1,000 lbs. hydraulic pressure on the hydraulic system and drive ¾ in. and 1 in. rivets with 75 tons pressure on the rivet. This we have found does excellent work. There is no chance to drive rivets with a lighter pressure, as the accumulator would be down and the operator would be unable to work his machine. With steam a careless operator could drive his rivets with 50 lbs. or 100 lbs. steam pressure, not taking the pains to go to the boiler house to see what steam pressure was being carried or to look at the gage. We have no hesitancy in saying that hydraulic is far superior to steam riveting. In reference to air machines, we cannot give any information as we have never used any air except for portable riveting machines."

ANOTHER SCHEME OF LIGHTS FOR NIGHT SIGNALS.

The difficulty of devising a satisfactory arrangement of colored lights for night signals has frequently been referred to in these columns and the perplexing problem of how to select or design a consistent system added to that of installing it after one has been designed, constitute a question which many consider as impossible of solution. Some go so far as to say that it is not necessary to attempt any improvement

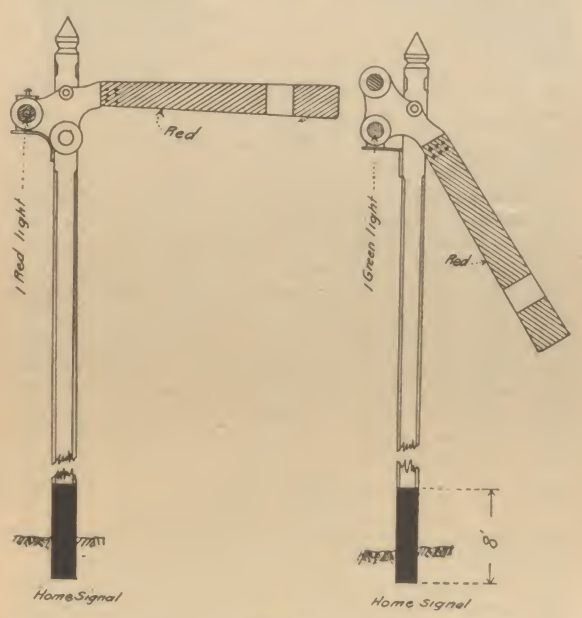


FIG. 1.

and would allow the matter to drop where it is. Notwithstanding the stumbling blocks, many persons are earnestly seeking for a satisfactory scheme and from the number of arrangements proposed, it seems impossible that all should miscarry. Through the courtesy of Mr. J. I. Vernon, supervisor of interlocking of the New York, New Haven & Hartford Railroad, the accompanying illustrations are shown of a system which he has devised.

He believes that there are but three colored lights which can be used satisfactorily for night signals, namely, red, for "stop," green for "go-a-head" and white lights, of which two are used for "caution." The arrangement proposed by him is shown as applied to

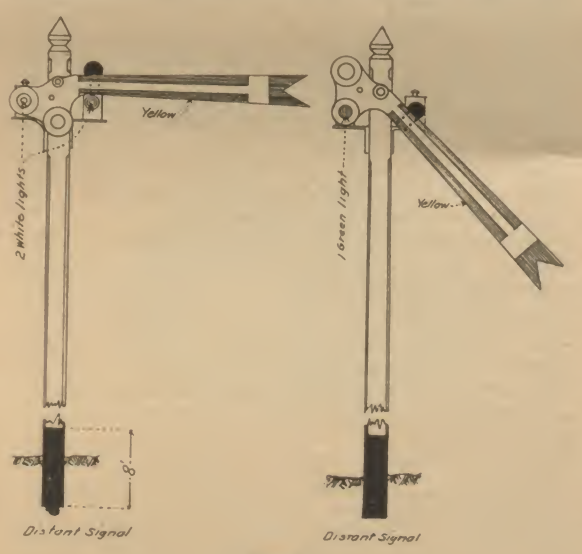


FIG. 2.

semaphore signals in Figs. 1 and 2, while Figs. 3 and 4 illustrate the application to home and distant pot signals for tannels. The engravings are lettered in such a manner as to indicate the lights which correspond to different positions of the blades and the targets. By using these combinations it is difficult to see how mistakes can be made which would lead to accidents through the breakage of discs, because if a red glass is broken, a single white light would be shown which is a "stop" indication and is the equivalent of a red light. There is also but one signal for "go-a-head" a single green light which can not be made in any other way than by placing a green spectacle before a white light.

Mr. Vernon strongly recommends the use of two white lights in a horizontal line as a caution signal, and remarks upon the fact that if one of these lights is extinguished a "stop" indication is given. The application to the tunnel signals will be easily under-

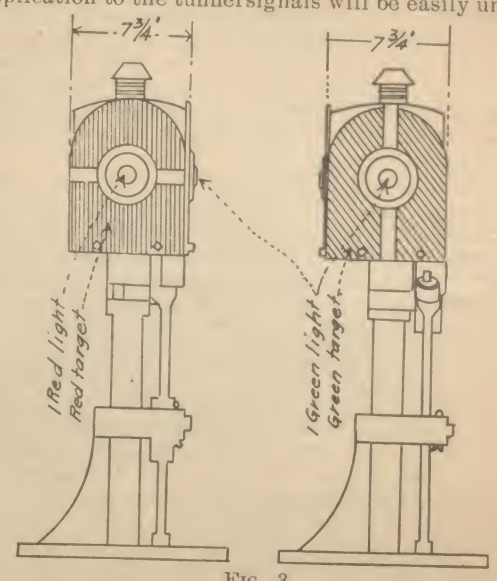


FIG. 3.

stood from the explanation already given. It should be noted in connection with this arrangement that Mr. Vernon does not introduce what might be termed a complication except as to the distant signal and there it consists merely in the addition of a single lamp. The number of distant signals at an interlock-

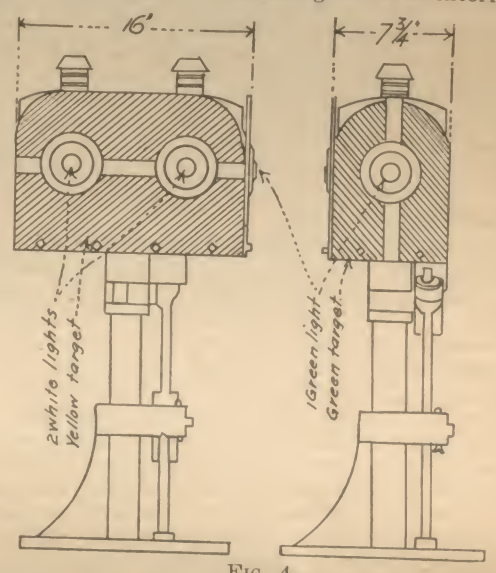


FIG. 4.

ing plant of even quite a large size, is not sufficient to raise any serious objection as to cost, and there seems to be much in Mr. Vernon's system to recommend it.

SHAFTS OF HOLLOW FORGED STEEL.*

In order to fully appreciate the reason why large shafts should be made of steel and "hollow forged," it will be necessary, first, to consider in detail the requirements which such shafts have to meet and then to determine upon the best material and apply it in the best manner to satisfy them. Shafts have various duties to perform. Sometimes they are subjected to torsional or twisting stresses only, as when a force is applied to a lever arm at one end and this force is resisted by the work which has to be performed at the other end. Occasionally shafts are subjected to bending stresses only, as when a heavy weight is carried in the center while bearings at the ends serve as supports. But most frequently we find shafts subjected to a combination of both twisting and bending stresses, as when an engine applies its power to a crank at one end to turn a shaft which supports at its approximate center, a heavy electric generator or a heavy belted fly wheel.

Authorities on machine design tell us that when considering shafts up to 10 in. in diameter, we may use 9,000 lbs. per square inch as the safe shearing resistance and tensile strength for wrought iron, and 12,000 for steel. When considering shafts above 10 in. in diameter, iron shafts must not be subjected to more than 8,000 lbs. per square inch and steel shafts to not more than 10,000 lbs. These figures are taken as one half the elastic limit of the respective metals. Thus at the outset we find that we are required to use a larger shaft if we chose to select wrought iron

*Abstract of a paper read by Mr. H. F. J. Porter before the Western Society of Engineers.

as our material than if we decide upon steel.

The first hollow shafts were introduced to this country by Fried. Krupp, of Germany. They were made of crucible steel and after boring were oil tempered to restore the strength that was taken from them by boring. The most satisfactory method, however, of accomplishing the results sought for is that known as "hollow forging," which was introduced into this country from England by the Bethlehem Iron Company when they built their present forging plant. I will endeavor to explain what is meant by the term and give reasons for its adoption.

In the first place, as the walls of hollow shafts are comparatively thin, and yet must do the work originally intended to be performed by the solid forging, the metal must be absolutely without flaw or defect of any kind, homeogeneous throughout, and thoroughly worked to give it strength. For this purpose, therefore, only fluid compressed open hearth steel is used and of a grade that will best insure satisfactory working. Its carbon may vary according to the purposes to which the forging will finally be applied, but its phosphorous and sulphur should not exceed .04 per cent. In order that the metal should be sufficiently worked to give it strength and toughness, the best practice requires that the ingot should be at least twice the diameter of the finished forging. It is also made from 25 to 50 per cent longer than otherwise would be necessary to take care of "piping" and "segregation." The ingot is subjected to hydraulic pressure, which is continued until the metal is solid throughout, great care being taken to cool it slowly and equally on all sides, as otherwise there is great danger of the surface metal shrinking on the hot metal within to such an extent as to be cracked open. The upper 25 or 50 per cent of extra length is then cut off and a hole nearly the size required in the finished forging is bored through the remaining piece. These two operations remove those portions of the ingot where impurities may have concentrated or where there may have been a tendency toward piping, and we now have a piece of steel that is as nearly perfect as can be produced. It is then ready for the forging process.

First, it must be reheated and as much care has to be taken in this operation as was taken in its cooling. For, as has been already shown, the metal in the interior of an ingot is already under stress, and heating it, if it were solid, is apt to increase that stress to such an extent as to expand the surface metal away from the center and leave cracks in the interior. The heat must therefore, penetrate it slowly and uniformly from all sides. The shape of a hollow forging, however, is in its favor. The hole in the center allows the heat to penetrate the thin walls from within as well as from without and thus the danger of cracking is to a great extent removed. After being reheated, a steel mandrel of the proper size to fit loosely is inserted into the hole, and the piece is placed under a hydraulic press where the metal is drawn out over the mandrel to the required dimensions.

One of the first requisites in forging is the proper selection of forging tools, suitable in design and power for the work in hand. The pressure applied in shaping a body of steel should be sufficient in amount and of such a character as to penetrate to the center and cause flowing throughout the mass. As this flowing of the metal requires a certain amount of time, the necessary pressure should be maintained throughout a corresponding period. Another reason why a higher factor of safety is placed on solid forgings more than 10 in. in diameter is that the forges do not possess hammers heavy enough to affect their centers; or if operated by top steam or by long drop they are able to be felt through the whole forging, the effect is produced by velocity of impact rather than by weight of falling mass. This results in damaging the surface metal, tending to draw it out, leaving the central portion behind, thus producing at times actual cavities. Besides the undesirability of using the hammer on steel for the above reasons, it is a very difficult matter to make a forging of this character, except by the use of the hydraulic press. A slow and even pressure is absolutely necessary to draw out the thin cylindrical walls equally, and make a shaft that is straight and symmetrical throughout. The varying impact of the hammer works the metal so unevenly that the mandrel would be apt to stick fast to the forging. For this type of the steel forging, therefore, it is practically imperative that the press be used, and thus the metal is unavoidably subjected to the best method of treatment.

With hollow forgings manufactured under the processes here described, the possibility of having a defective center is eliminated by taking out the center altogether. By substituting for it, during the process of forging, a mandrel, the latter acts as an internal anvil, and thus even in the largest hollow shafts the thickness of metal worked upon would be within the limits above mentioned. The use of hydraulic presses having a capacity of from 2,000 tons to 14,000 tons, selected according to the size of the forging under treatment, can leave no doubt in most incredulous minds that the metal has been thoroughly worked.

After the process of shaping to the proposed design has been accomplished, the piece must be subjected to a final treatment of "annealing." After all the manipulation to which it has been subjected, together with its frequent partial heatings and irregular coolings, it undoubtedly has strains set up in it. It is to relieve these strains that it must be annealed. This treatment consists in heating the forging slowly in a furnace and then allowing the latter to cool down slowly with the forging in it. All forgings, whether hollow or not, should be annealed, otherwise there is a certainty of the forging strains developing into weakness after they have been in service, causing them to get out of true, with a possibility of their breaking, particularly if subjected to alternating strains as in heavily weighted shafts or connecting rods, and especially piston rods, which are subjected to changing temperature. Annealing not only relieves these strains, but gives a finer grain to the metal and increases toughness.

On the treatment of steel after forging depends to a great extent its physical qualities, and it will vary in strength accordingly from that of the best wrought iron to between three and four times its strength. I refer not so particularly to the "elastic limit" as to its toughness and ductility, as shown by the "elongation" and "contraction of area." Annealing generally lowers the elastic limit slightly in well made forgings, annealed forgings showing it to be about 47 per cent. of the ultimate strength. It considerably increases, however, the "elongation" and "contraction." To develop these qualities to their fullest extent in any grade of steel, "tempering" is resorted to. This consists in heating the forging to a temperature which experience has shown to be right according to the purpose to which the forging is to be put and then plunging it into a bath of oil or other suitable liquid. It is then carefully annealed. This double treatment (which is properly covered by the one word "tempering") tends to harden it, breaks up the crystalline structure due to forging, and modifies the physical properties by increasing the elastic and adding toughness. Forgings must be hollow to be tempered successfully, otherwise strains would be introduced by the sudden shrinkage of the surface metal on the hotter interior when the piece is dropped into the cold bath, which instead of strengthening the piece results in weakening it, and possibly in bursting it into pieces. The thin walls of hollow forgings allow the heat to be extracted rapidly from both the inner and outer surfaces, and thus much danger of accident during this process is removed. Thus the shape of the hollow forgings allows the highest physical qualities of the steel to be developed.

With the substitution in the trade of steel for wrought iron in engine and miscellaneous forgings, the tendency has naturally been to use a mild or soft steel approaching iron as regards physical qualities and the ease with which it can be machined. Wrought iron has a low elastic limit, averaging about 20,000 lbs. per square inch in large sections, where proper care is taken in its production.

Although mild steel, when of good quality, is superior to wrought iron in strength, toughness, homogeneity and freedom from danger of imperfect welds and porous spots inclosing slag and scale, still it does not possess the very desirable quality of high elastic strength combined with ductility or toughness in as great a degree as can be obtained without danger in a harder steel, when proper precautions are taken in its manufacture. In other words, in the use of ordinary mild steel, only a partial advantage is taken of the most desirable qualities of steel which are easily within reach. In some instances where the amount of machine work in finishing is very great, and there is ample margin of safety in the design, as, for instance, is often the case with connecting rods, the use of mild steel may be advisable. Such steel contains about 0.2 to 0.25 per cent. carbon and can be guaranteed to show in specimens four diameters in length cut from a full-sized prolongation of forgings or from representative pieces, a tensile strength of not less than 57,000 lbs. per square inch and an elastic limit of not less than 27,000 lbs. per square inch, with an average elongation of 25 per cent.

For the general run of engine forgings, however, a harder steel should be used in which a tensile strength of about 75,000 lbs. and an elastic limit of 35,000 lbs. per square inch can be obtained with an average elongation of 20 per cent. in four diameters. When proper precautions are employed, forgings can be made with perfect safety of a still higher grade of steel, and this is especially recommended for crank and cross-head pins and for all parts subjected to severe alternating strains and wearing action. In this grade of steel a tensile strength of about 85,000 lbs. and an elastic limit of about 40,000 lbs. per square inch can be obtained with an elongation of 15 per cent in four diameters. If steel forgings are tempered they will possess still higher qualities than those above mentioned and can be furnished with a tensile strength of 85,000 to 90,000 lbs., and an elastic limit of 45,000 to 55,000 lbs. per square inch, and an elongation of 20 to 15 per cent in four diameters. By introducing about 3 per cent of nickel into the composition of steel, a finely granular or amorphous condition is obtained in forgings, and the very highest quality of steel is attained. By the combination of hollow forging and tempering this nickel steel, a material is obtained excelling all others known in elastic strength and toughness. Assuming that steel less than 10 in. in thickness may be submitted to a fiber strain of 12,000 lbs. per square inch, and when 10 in thick and thicker it must not be submitted to a greater strain than 10,000 lbs. per square inch, we may so reduce the thickness of metal operated upon in shafts of larger diameter than 10 in., by hollow forging them, that the walls will be less than 10 in. in thickness. The shaft for the Ferris wheel, for instance, the largest ever made is 45 ft. long, 32 in. outside diameter, with a 16-in hole through it. By allowing 10,000 lbs. fiber strain in metal less than 10 in. thick, we find that hollow forged shafts are shown to be as strong, or stronger, than solid shafts of the same outside diameter. Taking for example the Ferris wheel shaft above mentioned, we find that, when compared with a solid shaft of the same outside diameter, it has lost 25 per cent in weight and gained 12 per cent in strength.

MODERN IRON WORKING APPLIANCES.

III.

MOLDING MACHINES—BLOWERS.

Of recent years the use of molding machines has become very general and at the present time no railroad foundry is considered complete without some of these machines. This is particularly true where new cars are being built and therefore applies equally to car building establishments, as these cannot afford to be without them. In making such castings as brake shoes, oil box wedges and shells, these machines have been extensively used for many years, and of late they are being successfully introduced for making M. C. B. couplers. The illustration Fig. 12 shows one of these machines as manufactured by

FIG. 12.—PRIDMORE MOLDING MACHINE.

Henry E. Pridmore, and adapted for making brake shoes. This type of machine is applied to a great variety of work and is being used for making such castings as M. C. B. couplers, harvester wheels and experiments are being carried on with a view to using it for chilled car wheels. The lighter machines are portable and can readily be moved from point to point about the foundry.

There are only two operations in the manipulation of the machine. The first of these is that of filling and ramming the flask, and the second is that of dropping the lever shown at the right side of the machine which movement draws the pattern from the sand. The ramming on this machine is all done by hand, the manufacturers claiming that this is the only proper method for obtaining uniform work as a machine will not make proper allowance for variation in the depth of the sand over a pattern having an uneven surface. Small work is usually done on two machines one man making the cope on the first machine while another makes the drag on the second. On large machines more men can be used to advan-

tage, the number being dependant on the character of the work and the output required. These machines turn out very excellent work as the patterns are drawn out of the sand perfectly true and square, leaving all corners sharp and perfect. The machines are very simple in design and have no complicated parts to get out of order.

Power machines of various types are used, and one of the most common of these is made by the Tabor Manufacturing Co., and shown in Figs. 13 and 14.

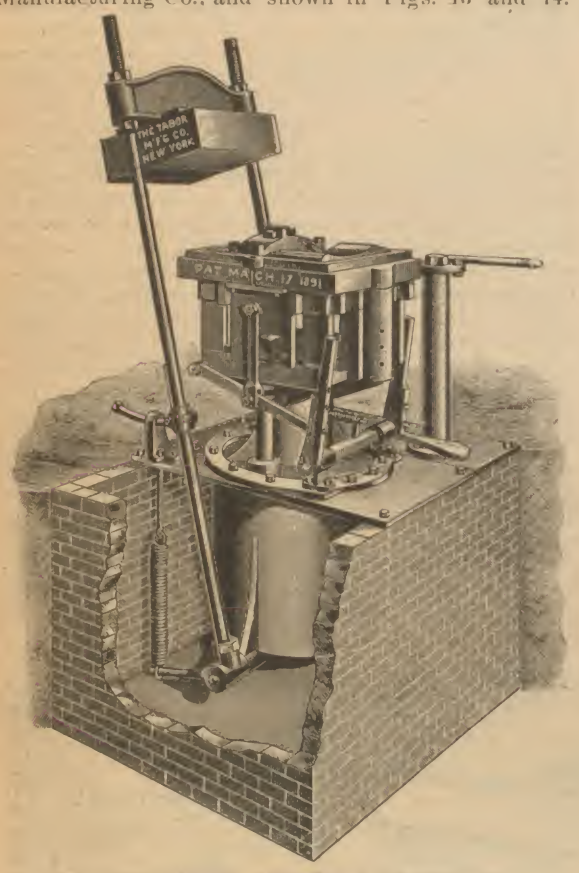


Fig. 13.—TABOR MOLDING MACHINE.

As these machines are operated by steam and are heavy and massive they must have a fixed location and the work be carried to and from them.

The machine above the floor consists of a table with upward projecting lugs, which support a frame to which the patterns are fastened. This frame has an annular space into which steam is admitted when the mold is rammed, for the purpose of warming the patterns, to prevent sweating, thus making them draw freely from the sand. Directly over this pattern frame, and resting on it, is the stripping plate frame to which the stripping plate is attached; on each side of the machine is a lever pivoted at the back end to the table and connected in the middle, by a link, to the stripping plate frame, the other end being free. In front of the machine is the tripping shaft with arms projecting upward along the line of motion of the free ends of the side levers. These arms are provided with stops which engage the free

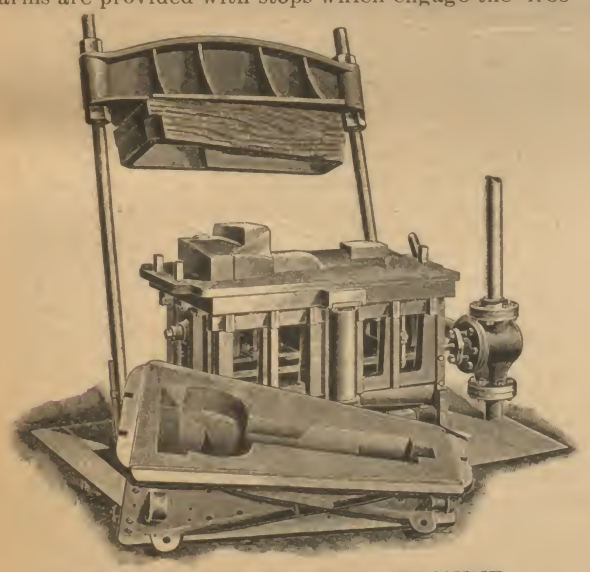


Fig. 14.—TABOR MOLDING MACHINE.

ends of the levers on the downward stroke, after the mold is rammed, reducing the motion of the stripping plate while the pattern is drawn through it. The ramming head is of wood, cut out freely over the pattern to prevent too hard molds where there is danger from "blows," and to insure good ramming at the joints.

The operation of the machine is very simple, and may be learned in a few minutes. The flask, with the sand box on top, is placed on the machine and

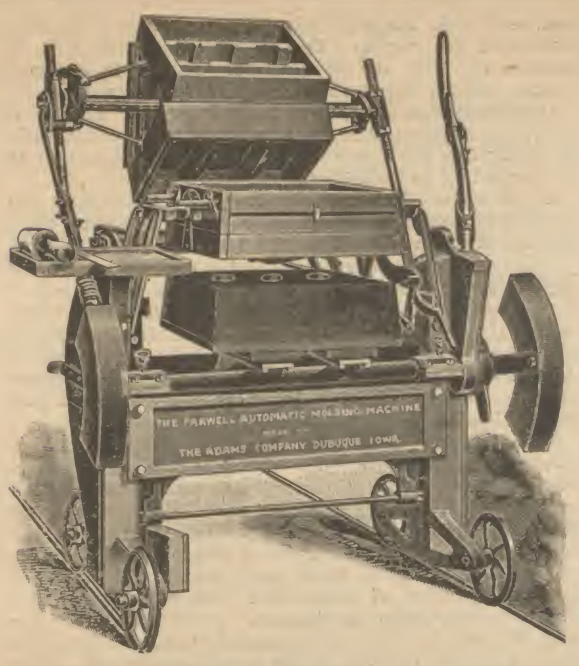


Fig. 15.—FARWELL MOLDING MACHINE.

filled with sand; the ramming head is then drawn forward from the position shown in Fig. 13 against the stops, and the throttle is opened, admitting steam to a cylinder below, which forces the piston upward, carrying the flask to the ramming head which enters the sand box and rams the mold. The throttle is then reversed, shutting off steam and opening the exhaust, allowing the machine and flask to descend. In the downward movement the side levers engage stops for drawing the pattern, checking the downward motion of the stripping plate just enough to give the patterns an easy draw from the mold. The ramming head is then thrown back; the sand box removed and

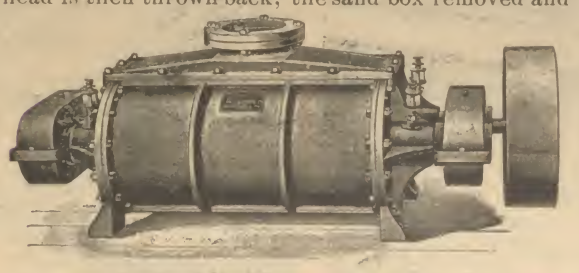


Fig. 16.—ROOT POSITIVE PRESSURE BLOWER.

the mold taken from the machine. As the operator moves away with the flask he presses the treddle with his foot, which returns the stripping plate to the position for the next flask.

The machine shown in Fig. 14 is a heavy one fitted for molding M. C. B. couplers. This machine was made to conform to existing flasks which are 41 in long, 21 in. wide at the large and 11 at the narrow end and 6 in. deep. One-half the flask is made at one time, and as the castings are of steel the ramming is much harder than with ordinary green sand molds. One of the advantages of this machine is that the ramming may be regulated to a nicety by changing the steam pressure, and after once being set the molds must be exactly uniform. For this reason this machine is frequently found in steel foundries.

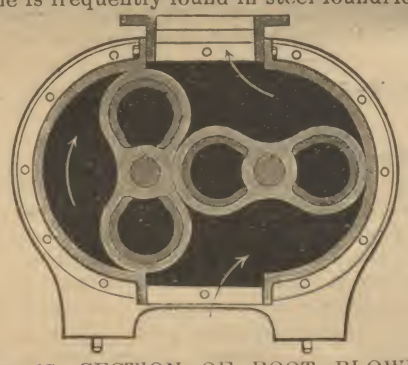


Fig. 17.—SECTION OF ROOT BLOWER.

An automatic hand power portable molding machine is shown in Fig. 15, which is made by the Adams Co. and is known as the Farwell automatic molding machine. This machine is mounted on wheels and is designed for making a snap mold complete and ready to be placed on the floor for pouring. Either wood or iron flasks are used and they may be of any size not exceeding 16x22 in. They are made tapering outwardly from the top down, in order to allow the mold to be easily removed. Pattern plates or match plates are used and the plates in use is carried by trunions between the separated parts of the flask. In operating the machine the flask is first separated and the pattern plate inserted. The flask is then closed, turned over, filled and peened for the drag. The bottom board is then clamped on the flask, turned over and the same operation performed for the cope, and after cutting sprue holes and gates the mold is removed to the floor and is ready to be poured. Each of the above operations is performed by the machine itself, the only work of the operator being a movement of the proper levers for accomplishing the end desired. The table is counterbalanced and therefore its movements are rapid and easy.

In blowers there has not been much change for some years past and the Root type of positive pressure rotary blower as designed in 1865 still stands at

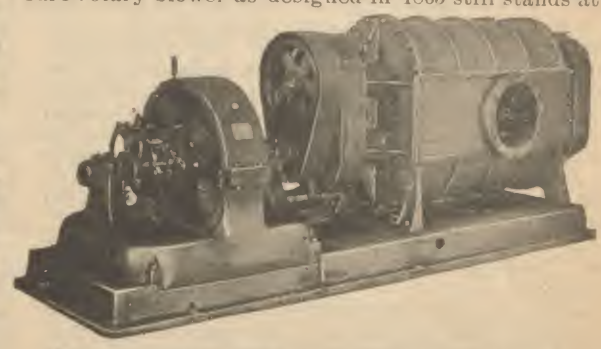


Fig. 18.—ROOT ELECTRIC DRIVEN BLOWER.

the head in machinery of this class. The illustration, Fig. 16, shows the general appearance of one of these blowers, and Fig. 17 is a cross section showing the interior arrangement and construction. All the surfaces of the impellers of this machine are finished so that the blast is continuous and regular as well as positive. The journal boxes used are of a special form and so constructed that all wear is taken up without changing the relative locations of the two impellers, which would interfere with their perfect operation. These machines are manufactured by the P. H. & F. M. Root Co., of Connersville, Ind., and a similar machine working on the same principle is made by the Connersville Blower Co., of the same place. Recent practice has in many instances led to the use of electric motors for driving these blowers, and when this is done they are both mounted on the same base, making a very compact and neat arrangement and one which is particularly advantageous where a live shaft is not convenient for driving. Such a combination is shown in Fig. 18, which illustrates a Root blower driven by a motor.

PHOTOGRAPHY IN SURVEYING.

The application of photography to surveying has been attracting increasing attention of late as the advantages offered by it are becoming more generally known. It is reported that a photographic surveying camera has been used with advantage in India, which photographs the magnetic bearing of the central vertical plane of the picture on the same plate with the picture. This camera is mounted on a tripod, with leveling screws, and turns on its axis on a horizontal plate with a graduated rim, permitting horizontal angles to be read when desired. On the top of the camera box is a level and a telescope, with an arm for taking vertical angles. The vertical cross wire of the telescope bisects the ground glass screen of the camera. A second vertical wire inside the camera is on the same vertical plane: and the shadow of this second wire is shown upon the plate when developed, making the center line of the picture. Behind this second wire is a compass, mounted on a rack inside the camera, by which it can be made to just clear the plate when a picture is taken. The graduation of the compass card is carried out on a vertical strip of translucent material through which the light passes to the plate, thus photographing the compass bearing on the plate. A horizontal wire is also photographed on the plate, showing on the picture the true horizon, when the instrument is properly leveled.

Writing upon the subject of photography in engineering work in "The Transit" Mr. Edward S. Smith says:

In almost every department of the civil engineer's work there are places where the intelligent use of a camera would not only lighten the engineer's work and insure greater accuracy, but photographs thus obtained would serve as a valuable reference afterwards and perhaps be a direct saving to him of time and trouble. For instance a transit man engaged in locating a railroad line through a portion of the Rocky mountains where the topography of the country was very rough and uneven took very careful notes of the work, but found upon returning to the office to plat his notes that a very important feature of a certain part of the region had been omitted. As a knowledge of this feature was necessary for a correct map it had to be obtained even at the expense and inconvenience of a return trip of 30 miles.

Here as in many similiar cases a good photograph

would have shown all that was needed and enable the topographer to proceed with the map without interruption.

To the bridge engineer photography is a right hand assistant. Almost any bridge report, any of reasonable importance, will show at once in what way the art was invaluable in advantage of illustrating completely and at a minimum cost.

A party equipped for a rapid tachometric survey could consist of only four, or at greatest, five men, and bring back vastly more serviceable and valuable notes than the ordinary survey party of from 12 to 20 men. It should consist of, first the engineer in charge, who should be a man of wide range of experience rather than a minute technologist. Besides directing the party, his notes should cover the general characteristics of the country. Second, the transitman. Third, the stadia-rodman, and perhaps a back flagman and general utility man. Fourth, the photographer, who should at the same time, be a rapid and skilled topographer, to quickly supplement his negatives with notes of topographical features of the route. Such notes, in the hands of competent draftsmen can be developed into most satisfactory maps, and accurate detailed topography be reproduced from the photograph.

The foregoing will serve to show in a general way the use of photography in the preliminary reconnaissance of a survey.

Now some of the more ambitious adherents of the new application have gone even farther and proposed that actual measurements be taken from the photograph, thus supplanting much of the usual work of surveying. Theoretically the proposition seems correct, as for its value in real practice, experience alone will prove whether it may be used with accuracy and rapidity or not.

The new method is based upon the fact that the image formed upon the sensitive plate represents a series of right lines passing through the center of the lens from the landscape to the plate. If, therefore, the plate is in correct position it will give a mathematically correct copy capable of direct measurement, and to a much greater degree of accuracy than would at first be imagined. In other words a photograph taken with a suitable lens is a true prospective in which the focal length is the distance line. By drawing the horizon and principle lines all the measurements which are usually taken on the ground may be obtained from the photograph.

There is, however, this difference, that while with the ordinary surveying instruments the topography is restricted to comparatively few constructions, photography affords a great variety of processes by the application of the inverse laws of perspective. The focal length of camera best adapted to this work is from 12 to 15 in. For purposes of precision the plate must be truly vertical, and for a proper definition of the horizon, two of its edges should be horizontal. The angle covered by the plate must be known and sufficient lap allowed to join consecutive photographs in order to convert them into a complete panorama of the region. Then knowing the point of observation, the intersection of a series of views taken at successive stations, determines any desired point in the field of view.

The first application of mathematical perspective to surveying is due to Col. Laussedat of the French army. In 1850 he conducted a series of experiments before a commission appointed by the war office. His perspectives were obtained by the camera-lucida, but a year or two afterwards he substituted photography, using a lens, yet the method is the same.

This method may at first seem merely hypothetical and be looked upon as of no real practical value whatever, yet the fact that surveys of this kind have been made and have proven to be satisfactory, ought to be a strong argument in favor of its adoption or at least it should be regarded as a subject worthy of careful investigation.

Regular photographic surveys were commenced in the main range of the Rocky Mountains at a point near the Canadian Pacific Railroad in 1888. They have since been continued without interruption until they now cover an area of over two thousand square miles. Five hundred square miles is the extent of ground which a party traveling rapidly can see during one season. As "photography, no more than any other process, will permit what has not been seen to be mapped" this must be the limit for that section of the region. The distance covered will, of course, vary with the terrain, being greater in an open country and smaller in a rough and broken district.

At each station it requires the topographer but a few minutes to observe angles and expose plates. Practically he is traveling the whole time except at such times as he is retarded by bad weather.

At the end of the summer season the topographer and his assistant employed the balance of the year in the office platting their survey. The plat was made on a scale of $\frac{1}{20000}$. Any other convenient scale may be used, that being selected which seemed most suitable to the extent of the survey. A brief description of the plat of a certain section of very rough country made from these notes and photographs may serve to show some of the advantages of the method. The area covered an extent of sixty-three square miles of the wildest and roughest country in that part of Canada.

The plat was made from six stations inside and eleven stations outside of the area. One thousand and seventy-five points were fixed by intersection or by construction equivalent in accuracy. These were taken from but thirty-five photographs which would probably be the minimun number for that extent of area. There would be no great difficulty in fixing more points and obtaining greater accuracy; of course, the limit might lie in the time to be devoted to the platting. In the above case the rule adopted was that the topographer and his assistant must plat the surveys of the preceding season before they start again for the field. One of the most important advantages of this method is that, if at any subsequent time a more detailed plan of a particular locality were required it could be prepared from the same views and thus save the necessity of returning over the ground.

Now the cost of the survey must be considered and herein lies another advantage of the new method. In the above particular case the cost was but $7.40 per square mile of territory, according to the estimate of the engineer in charge. This estimate is about half that which a survey by the ordinary methods would cost, and the decrease in cost is largely due to the fact that the number of men required in the former case is about one-third that of the latter.

The process of employing photography universally in surveying methods would perhaps not be practicable; that is the camera cannot supplant the transit, nor does anyone intend that it should, but in the solution of problems which present themselves to the topographical engineer, where the conditions are such as to render the ordinary methods inadequate or at least very difficult, photography lends a ready hand, and at once proves its valuable service.

FIG. 1.—SWITCH SET FOR MAIN LINE.

FIG. 2.—SWITCH SET FOR TURNOUT.

AN IMPROVEMENT IN SWITCH AND LOCK MOVEMENTS.

Before drawing up plans of any interlocking plant upon which to base estimates of the probable cost, the manner in which the several switches and derails are to be worked must be decided upon, for the number of levers required varies considerably acording to the way in which they are connected. The smaller the number of levers the less material will be required and the lower the cost will be, while at the same time the different routes may be more quickly set up. The two ways of moving and locking a switch now in common use, are by what is known as the facing point lock and by the switch and lock movement. With the facing point lock one lever is used to move the switch, while a second lever is used to lock it; whereas, with the second method the moving and locking are accomplished by the same lever, the first part of the stroke being made to unlock the switch, after which the switch is moved and lastly locked in its changed position.

An article on the merits of these two methods was read before the Railway Signaling Club, and was published in the RAILWAY REVIEW of September 26, 1896, the claim being made that if the signal was properly bolt locked either method was safe. The points brought out in the paper were that the apparent superiority of the facing point lock lay in the long travel of the lock plunger, it being impossible to reverse the lever unless the plunger had entered the hole in the lock bar insuring that the switch was closed, while with the switch and lock movement owing to the short locking travel (but 1½ in.) it is possible to spring the lever over while the switch is slightly open, thus permitting the signal lever to be pulled over and the signal to be cleared. This, without the bolt lock, would be a very unsafe way of operating a switch, but with a bolt lock which is a very simple device made of two notched slide bars working at right angles with each other, a perfect check is placed upon the movement of the signal, inasmuch as the signal cannot be cleared unless the switch point has been properly closed. Considering the switch and lock movement as safe, there is no reason why it should not be used, as its cost compared with that of the facing point lock is very much less. To those who still have their doubts as to its safety, we would suggest that they examine the improvement recently made by Mr. Elliott of the Chicago, Milwaukee & St. Paul Railway in the locking part of the movement, which makes it impossible to spring the lever over unless the switch has been properly closed, thus giving the same measure of safety as with the use of the facing point lock.

The improvement, illustrations of which are shown herewith, consists merely in lengthening the travel of the driving bar 3¼ in., making it 12 in. instead of 8¾ in., the dimensions of the switch crank, by which the movement of the bar is made to change the switch, being the same, and the additional travel is used entirely for locking. With the ordinary 8¾ in. travel of the driving bar, but 1½ in. at each end of the stroke is used for locking, the plunger entering the hole in the lock bar for that distance, while the remaining 5¾ in. is used for moving the switch. With the new movement 3 in. of locking travel is obtained at each end of the stroke while the same amount as before, or 5¾ in. is used for moving the switch. Increasing the travel of the driving bar, of course, decreases the leverage, and it was expected, before a trial of the movement had been made that much more force would be required to throw the lever. This, however, has not proved to be true with the five movements now in service, and in consequence, the road referred to has decided to make use of this movement wherever it is practicable to use a switch and lock movement. One of these applications has been made to the switches of a crossover in the Western avenue yards of the Chicago, Milwaukee & St. Paul Railway in Chicago, the two switches being operated by means of a single lever. With the lever 6 ft. long and a lever arm of 15 in. for the pipe connection an average pull of but 175 lbs. is required to move the switches either way, which is a remarkably low pull.

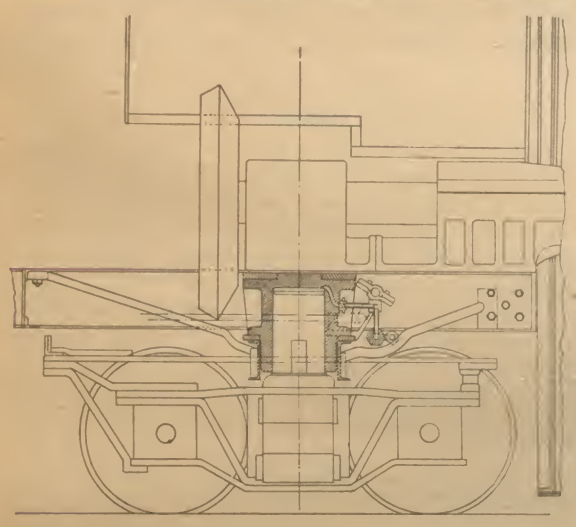
At a plant having three of these movements in service a test was made to see if the lever could be sprung over with the switch open. This was tried by disconnecting the lock bar from the point and moving it so that the plunger would not enter the hole in the bar in the same manner as if something had prevented the switch from closing. Two men were placed at the lever with orders to throw it, but they only succeeded in bending it, the latch not being brought nearer than 3 in. from the end of the quadrant. This same test was made on a movement having but 1½ in. locking travel, with the result that the lever was easily latched, and with one man pulling it was pulled over to within ½ in. of the end of the quadrant, showing that if the plant had not been a new one the lever could have been pulled over by one man.

In connecting up a movement having 12 in. travel the travel of the pipe line is made 12 in. throughout, and the extra travel is not obtained by increasing it at some crank near the switch. To do this the lever is provided with a long arm, such as is used for wire connections, and a 12 in. vertical crank is used, no cranks smaller than 12 in. being used anywhere in the connections. If two-way cranks are used, these are made 12 in. and 14 in. long, if the connection has to be made on the shorter of the two cranks. A compensator is used for every 450 ft. of pipe line and no trouble is anticipated as there is plenty of clearance between the ends of the cranks.

In the movement of derailing points this feature of a longer locking travel is applicable without any change of present construction, as, but the usual 8¾ in. of travel is required while the 3 in. locking travel is obtained. With a derail it is necessary to lock the point only when closed so that if the bar is adjusted to lock the point at one end of the stroke the full movement of the point will be obtained and the point will be fully locked when closed, the same measure of safety being secured as with the 12 in. stroke of the driving bar. The signal men on the Chicago, Milwaukee & St. Paul Railway are so well satisfied with this improvement that they are now lengthening out the plunger and moving back the driving pin on all old movements on derails to secure the 3 in. locking travel and a much safer construction is thereby provided. We are indebted to Mr. George Gibbs, mechanical engineer and to Mr. W. H. Elliott for this information, and for the photographs.

HYDRAULIC ATTACHMENT FOR RAISING ROTARY SNOW PLOWS.

The employment of hydraulic cylinders upon a rotary snow plow for the purpose of raising the end of the machine complete, may be regarded as quite a novelty and through the courtesy of Mr. J. O. Pattee, superintendent of motive power, and Mr. H. H. Vaughan, mechanical engineer of the Great Northern Line, an arrangement of this kind is shown in the accompanying illustrations. This arrangement consists of three hydraulic rams so arranged as to



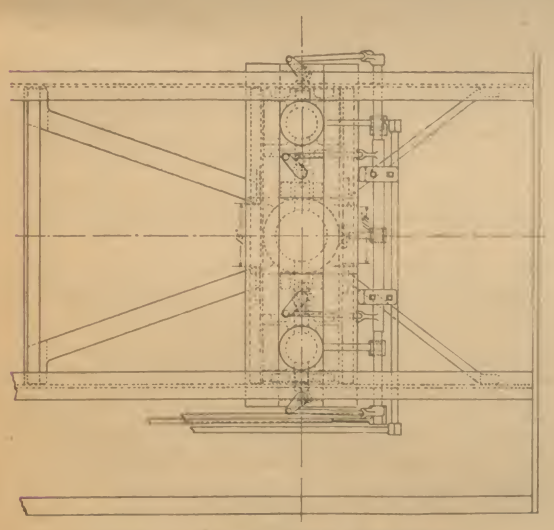


FIG. 1.—PLAN AND SECTION.

permit of raising the end of a rotary snow plow with reference to the trucks. It was designed by the gentlemen referred to to meet a serious difficulty in the working of the switchback whereby the road crosses the Cascade Mountains.

This switchback has ten legs, the total length of the track being about seven miles, though the actual distance traveled is a little over two miles, the maximum grade being 4.4 per cent. Mr. Vaughan says that the snow fall is very heavy in that district, as much as 70 and 80 ft. having fallen in a season. On account of the temperature, the snow is very wet and packs so badly that the only means of keeping the tracks open is by the use of rotary snow plows. On the switchback, two plows are used with two consolidation engines coupled between them, the plows being at each end of the aggregation, the front one working in the snow. By this arrangement the two

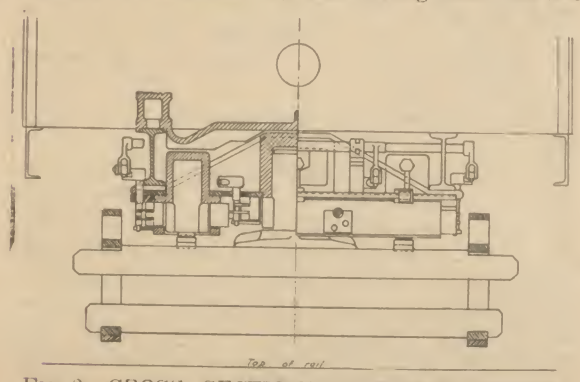


FIG. 2.—CROSS SECTIONS THROUGH TRUCK.

plows can clear the switch back without turning, in fact this is about the only way in which such a piece of track can be cleared satisfactorily under such conditions. There would be no difficulty in handling the snow with the ordinary rotaries were it not for the fact that its consistency is such that much of it falls back upon the track and was formerly packed down hard by the hood of the idle plow which was, of course, running backward. This gave a great deal of trouble, for the reason that it was frequently necessary to run the plows over the switch back ahead of every train and the loose snow was paced into a solid mass of ice between the tracks by the weight of the trailing rotary. This had to be cleared out by hand, which was a difficult and expensive job.

It was decided to arrange the hood of the rotary so that it could be raised about five inches when running backward, this being enough to enable it to clear the snow on the track. An attempt had been made in one case to accomplish this purpose by arranging a loose plate on the hood, but in view of the severe strain which was brought upon the cutting edge, it was believed to be better to go to the expense and trouble of raising the plow body and hood so that the plow when working should be as rigid as possible in order to sustain the heavy stresses imposed upon it. The method of accomplishing this is shown in the accompanying illustrations of which Fig. 1 shows a longitudinal section through the end of the car at the center pin of the truck and a partial plan view. Fig. 2 shows two cross sections through the truck, and Fig. 3 shows the details of the hydraulic cylinders and plungers. The larger of the two cylinders is illustrated, the smaller one, being quite similar to the larger, is not shown.

A new body bolster was made for the plow, at the front truck, which had two top plates of 1 x 7 in. material and one bottom plate, which was 1 x 21 in. in section, the bottom plate being stiffened by two channel irons. This bolster carries three hydraulic cylinders. The larger one which is 10½ in. in diameter, is placed in the center as shown in the lower view of Fig. 1 and also in Fig. 3. These two illustrations show the two small or 6 in. cylinders near the outside ends of this bolster. As the load to be lifted was about 70,000 lbs., a pressure of about 500 lbs. per square inch was required to do the work. The rams in these cylinders were formed with wings as shown in Fig. 3, working in guides on the cylinders, and sliding blocks were arranged so that when the plow had been raised to a sufficient hight, these blocks could be slid between the wings on the rams and the guides on the cylinders, and then by releasing the fluid pressure in the cylinders, the weight of this end of the plow would be taken on a solid metal bearing instead of depending upon the pressure for holding up the weight. These locking blocks, six in number, are worked from a shaft running across in front of the bolster, which are connected by a rod which is operated by a lever in the engine room. Short levers on the cross shaft are connected to short vertical shafts provided with crank arms which are linked to the sliding blocks referred to. The pressure is furnished by a small pump mounted upon the top of the boiler which takes water from a reservoir in the engine room. The piping is so arranged that the water is led from a pump by a pipe which connects with with the three cylinders and a discharge pipe is provided to allow the water to return to the reservoir from the cylinders. Provision is also made by means of valves controlled from the engine room for keeping the water in circulation through the pipes to prevent freezing. The pump may be run slowly for this purpose and by using the proper valves, its course may be changed to bring the pressure upon the rams. By this construction the plow can be raised five inches in about two minutes. The device has been in use for two winters, during which time it has given complete satisfaction, and it is certainly an interesting and ingenious piece of work.

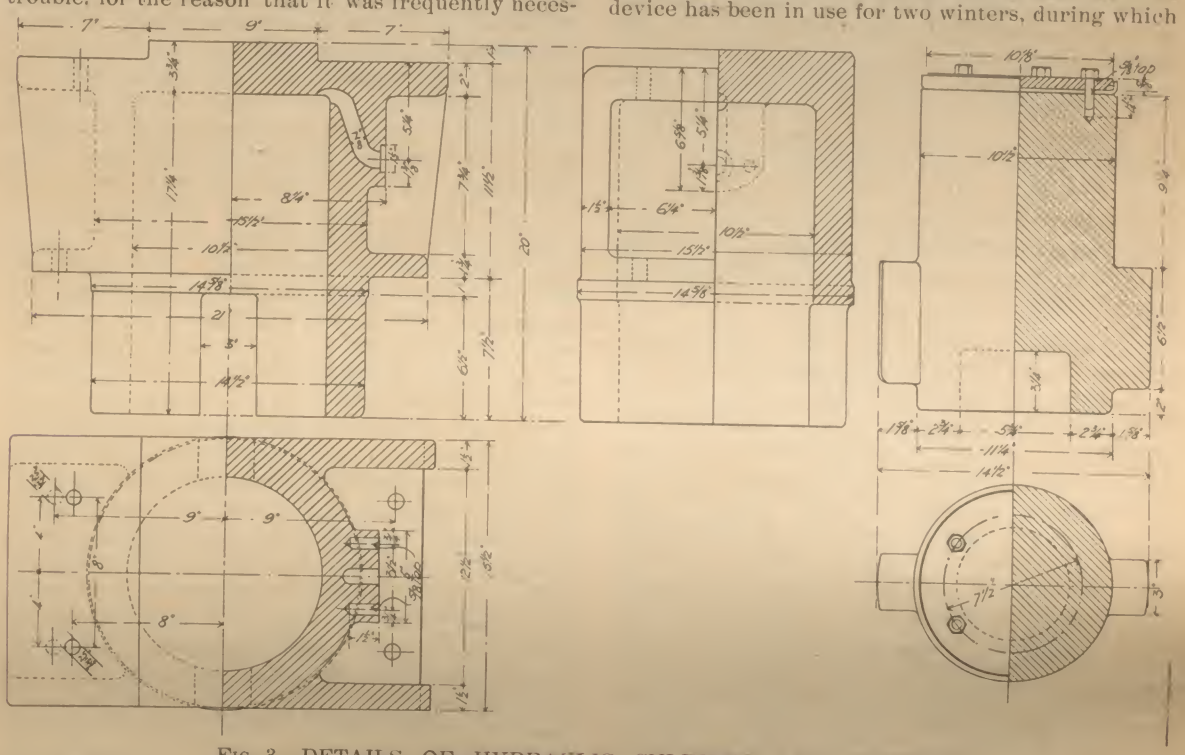


FIG. 3.—DETAILS OF HYDRAULIC CYLINDER AND PLUNGER.

The Western Railway Club.

The regular November meeting of the Western Railway Club was held at the Auditorium Hotel, Chicago, Tuesday, Nov. 17, with an attendance of about ninety members. Under the head of unfinished business a discussion of the report presented by a committee of the October meeting upon the subject of "Some difficulties which have arisen under the new interchange rules," was completed and a number of the recommendations made by the committee were referred to the arbitration committee of the Master Car Builders' Association. The next subject taken up was a report by a special committee upon "Recent developments in M. C. B. couplers," which was presented by Mr. J. N. Barr, chairman of the committee. The special features which were mentioned were difficulties in regard to the accidental uncoupling of automatic couplers in trains, and the trouble which had arisen on account of the non-uniformity of couplers with reference to the length of the guard arm. Following this, the closing subject was "Recent developments in the tonnage system of rating locomotive performance," and the discenssion was confined to comparatively few members and to communications which were read by the secretary. It was made clear that the introduction of tonnage rating had produced a marked effect in the number of cars hauled per train, and that it was an improvement over the old system of rating by the number of cars. The chief participants in the verbal discussion were Mr. A. E. Manchester and Mr. J. H. McConnell, the latter gentleman giving a large number of detailed figures showing the considerable improvement which had been effected on the Union Pacific Railway.

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CHICAGO, SATURDAY, NOV. 21, 1896.

A RECENT case in Alabama has developed the fact that railway corporations are subject to a new danger which heretofore has been overlooked. It appears that a young, and presumably pretty lady, while traveling on the cars of the Southern Railway Company in Alabama, was kissed by one of the conductors of the company, the result being that the company was obliged to pay two hundred and forty-five dollars damages. The account of the case conveys no information as to the personal appearance of the conductor, but from the amount of damages claimed it must have been objectionable in the highest degree. All of which goes to show that train officials must either be wholly unobjectionable in manners and appearance, or else should be required to give bonds to refrain from osculatory exercises while on duty.

THE constantly diminishing scale of revenue for railroad service is drawing attention to the fact that the basis upon which freight rate schedules are formulated in this country, is radically defective. The present form provides for a single charge for the entire service performed by the carrier in receiving, forwarding and delivering freight. That is to say no distinction is made between the handling and terminal charges, and the carrying charges. In England, these services are made the subject of two separate charges, the first being a fixed quantity and latter a variable one. That the English method is by far the most scientific as well as equitable, cannot be questioned. The cost attaching to the receiving, loading, billing and delivering of a given shipment is practically constant, whether it is transported five miles or five hundred, and there is no good reason why short distance traffic should not be made to bear the actual expense attaching to its handling, instead of making the longer distance traffic pay a proportion of it, as is now the case. No one thing in our railroad economy more needs a thorough reorganization than our methods of rate making. The whole system, both of classification and tariffs, needs a radical change, and the sooner it is commenced the less difficult will be the task and the more profitable will be the result.

IT is increasingly apparent that it is the purpose of, and within the power of, iron and steel makers to control production and maintain prices on any products they desire, and that too despite a productive capacity considerably in excess of any immediate demand. The steel billet combination has met and determined that billets are worth $20.25 a ton at mill. A heavy demand has been held in check until the combine spoke. A reduction was hoped for. The steel rail makers will soon speak. Structural steel makers have practically determined there shall be no competition that will reduce current prices. Bridge builders have large requirements to cover, and within ten days orders have been sent to mills for upwards of twenty thousand tons of material. There is much more business in sight. A large amount of business has been done in plate iron and steel within a few days. The entire iron trade is in better shape, but the bulk of the demand is just now within the lines mentioned. It appears that several railroad companies have instituted efforts to negotiate loans for the purchase of betterments, and steel makers who are interested in following this phase of the matter believe that a large amount of business will be, as a result, ready for the mills before or by the end of the year. The chief interest to the steel industry now is in the preparations large consumers are making to purchase largely of material and equipments. Nearly all the larger mills are now working full time after long periods of partial operation. Much new business has been heard of and inquiries are increasing for the heavier and lighter products of mills. The structural mills are capturing large orders, bar mills and sheet mills gain business slowly. Pig iron production has increased about 13,000 tons per week and is now in round figures, 125,000 tons per week, an expansion is assured at ssronger prices, but nothing of a speculative character in this or any other branch of the iron trade is at present regarded as probable.

ATTENTION is called to a paper printed in this issue which presented at the meeting of the Grain Dealers' National Association, held in Chicago, November 9. The subject under discussion was the liability release clause in railroad companies' ground leases, and, as will be seen by a perusal of the paper, the familiar and time-honored position was taken that railroad companies have no rights which others are bound to respect. The paper conveys the idea that railroad companies, and not the owners of the elevators built upon their right of way, were the parties chiefly interested in such construction and alone profited thereby, but the writer of the paper, as well as those to whom it was addressed, must have known that in a majority of cases, the reverse is true. Grain, contiguous to railroads, will be shipped upon such roads whether elevators for handling the grain are provided or not. It is true that such elevators are a convenience to the railroad, but it is also true that the chief benefits of such elevators accrue to their owners. The application for a permit to build an elevator comes from the individual, and the railroad in granting such application, naturally seeks to protect itself from loss, which is liable to happen because of such construction. The builder of these warehouses fully understands the condition of the contract when he makes it, and it savors of the "baby act" to seek to escape the consequences of his deliberate action. Every one understands that danger of fire is a natural consequence of proximity to a railroad, and that it is impossible under present conditions, to avoid this danger. The absolute spark arrester has not yet been invented, and until such is the case, liability of fire is always present; but notwithstanding this fact, the courts invariably hold such fires to be the result of negligence. It is manifest, therefore, that the only possible means of protection left for the railroads, is the very contract to which objection is made. The elevator owner can protect himself by means of insurance, but if the railroads were denied the right of contract which now exists, it would be absolutely without power to protect itself from loss. It is always best to be fair. The construction of these elevators is a matter of mutual convenience, and it would seem that if the railroad company in addition to its nominal charge for ground rent, builds a side track to the warehouse free of charge, as is usually the case, its part of the mutual obligation is fairly discharged.

THE COST OF FIRING COAL.

From information obtained from a number of large manufacturing plants in which not less than fifty tons of coal were burned per week, the Steam Users' Association, of which Mr. Edward Atkinson of Boston is at the head, has issued a circular which contains interesting information as to the cost of boiler room labor. It was found that the firing of a ton of hard coal takes no more hours of labor than are required for firing a ton of soft coal, and the cost of hard coal firing is increased from five to ten cents per ton on account of the higher wages paid the firemen in hard coal plants. From fifty cents to a dollar more per week is paid to men handling hard than is paid for handling soft coal. The men fire about fifteen per cent more coal and receive about ten per cent more pay in plants that run twenty-four hours over those that run but ten hours a day, which results in a saving of five per cent in the plants which run twenty-four hours per day. The labor per ton of coal is about ten per cent less for a steady than for a variable load of any sort. Men do from fifteen to twenty per cent more work and get about ten per cent more pay, according to whether the plant is worked to its full capacity or not, which is an indication that the plants which provide a small amount of grate area per ton of coal or average a high amount of coal per square foot of grate per hour, effect a saving of between five and ten per cent. Shaking and dumping grates use more expensive men, and each man fires less coal than cheaper men on ordinary grates. Handling coal was found to cost about 1.6 cents per ton per yard up to five yards, and then about 0.1 cent per ton per yard for each additional yard.

The statement is made that "cheap men do as much work as good men," and that the cost of labor is almost always less per ton of coal with cheap men. This is somewhat modified by the observation that the quality of the work may not follow the expense of it and that the cost per unit of steam is not necessarily lower with the cheap men. It may be stated as a fact that cheap men do not produce steam for a lower cost than good men will produce it. As to mechanical stokers, it was found that thirty and forty per cent was saved in labor in very large plants, and that there was no saving in labor in small plants. From one test only, the down draft grate was found more expensive in labor than the ordinary grate. Further reference is made in the report to the effect of a steady, load and the conclusion was reached that there was not much difference in cost between a load which varied hourly or monthly, but that a steady load all the year round gave from five to fifteen per cent better results than an unsteady one, such for instance as a cotton mill as compared with an electric lighting station. If this comparison was carried still further so as to include the extremely variable loads of electric power stations for a surface or elevated electric railway, doubtless some of the reported high cost of operation of these plants might be explained.

The idea has gone abroad that with mechanical stokers the wages for handling coal will become practically nothing, but these returns show that in very large plants only about twice as much coal is fired per man with the mechanical stokers as is handled by shovels, and the cost of handling the coal is reduced only sixty per cent as a maximum, and with two medium sized plants the cost approaches very closely to that for doing the work by hand. Expensive men are not necessary with stokers and these results indicate that about 40 per cent of the labor may be saved in plants burning 200 tons per week, while in plants burning from 50 to 100 tons per week, about 20 to 30 per cent of the labor may be saved and that there is practically no saving in labor in plants burning less than 50 tons per week. These figures check very well with results of the investigation as made by Mr. R. S. Hale, in Europe, for this same organization, in which it was stated that stokers saved about 33 per cent in labor in large plants and none in small ones. Mr. Whitham in a paper before the American Society of Mechanical Engineers, placed the saving in labor for large plants at 40 per cent.

This information may be criticised as not being sufficiently definite to admit of generalizing or improving upon methods of handling fuel, yet the cost of firing is so seldom known that any reliable statements upon the subject will be valuable. The information was gleaned from subscribers to the association and the number of boilers represented is 2,212 of which 595 were concerned in the statistics given. The total consumption of coal per week was 8,302 tons and the total coal consumption represented by the members of the association is 1,548,400 tons per year. The total weekly payroll is interesting with particular reference to the large plants as from it is obtained the average cost of 48 cents per ton for handling fuel, and the minimum cost reported is 26 cents per ton. If all the plants were brought to this figure it would mean a saving of $340,648 per year to

ese plants as the total yearly cost for handling coal for the members of the association is $743,232, and as this is approximately 50 per cent of the total yearly cost of handling coal, it is evident that the locomotive is not the only "coal eater". It must be remembered that this estimate of saving is to be distributed only among 381 plants.

GRAIN DEALERS AND THE RAILROADS.

At the meetiug of the Grain Dealers' Association held in Chicago during the current month several subjects were under consideration in which they, in common with the railroads, have a vital interest, and which were in the main considered with a reasonable degree of fairness. A point of special interest made, and to which this journal has often referred, was in connection with the recent advance in grain rates. The question was asked, "if rail carriers can afford to carry grain from Missouri river points to Chicago, for a month or more, at ten cents per hundred pounds, why cannot they afford to keep the rate in force all the time?" The answer to this question can easily be given by those versed in traffic affairs, but it is doubtful if any one can answer the question in a way that will be satisfactory to the shipping public, or what is more important, to those who assume to legislate upon railroad matters. The voluntary, or what to the general public seems to be the voluntary maintenance of low rates for a long period of time, will be considered ample evidence of their profitableness, and no one but a railroad man can be made to understand that such is not the case. Statements of railway officials concerning railway matters are not given the least degree of credence by those on the outside. Too often these statements are of such a character as to fully justify the estimate placed upon them, but when a man of such acknowledged probity as W. C. Brown, of the Burlington road, is told, as was the case, by a gentleman to whom he was well known, "On general matters I would accept any statement you might make without question, but in regard to railroad matters, I would not believe you under oath," it is of very little use to deny the profitableness of such a rate as is here referred to.

The question of clean bills of lading for grain was also under discussion, and it was evident that grain shippers realize the main difficulty in the case, to wit: the unreliability of outturn weights. But at the same time it was recognized that the elevators at destinations, were largely the property of the railroad companies and might therefore be placed upon such a basis as would conserve the interests of the railroads and their patrons. Railroad companies would do well to accept the inevitable. Clean bills of lading for grain are bound to come and it is the part of wisdom to accept the situation and provide for their adoption in such manner as will be to the mutual interests of the parties concerned, instead of attempting to fight the proposition and thereby engender an opposition which will manifest itself in legislation, in which the burdens will be placed upon the carrier. In this matter the shippers have right on their side, an advantage of which they are fully conscious. It is for the railroads, therefore, to recognize that the odds are against them and make such provision as will be fair to both parties.

The subject of minimum and maximum car loads also received attention at this convention, but in this matter the position taken was wholly wrong. The placing of the limit in either direction, four thousand pounds above or below the marked capacity of the car, was regarded as an attempt to "tax the grain business out of existence," whatever that may mean. Shippers are fully aware of the fact that the capacity of cars varies greatly. They ought also to know that in order to profitably haul a car it must be approximatetly loaded to its capacity on the one hand, while as a matter of safety it must not greatly exceed such loading on the other. To cover this point every car is plainly marked on the outside with its carrying capacity in pounds, and in most cases the load line for the various kinds of grain is marked on the inside. There is however no man in the grain business who cannot tell at a glance whether a car is loaded within the limit of 8,000 pounds allowed between maximum and minimum weight. When a man puts 40,865 pounds of corn into a 30 000 pound car, which was one of the cases cited, he is fully aware of the fact that he is dangerously overloading the car and doing his best to wreck the train in which it may be carried and instead of being compelled to pay an extra six cents per hundred pounds for the extra weight above 34,000 pounds, he should have been charged first-class rates on the entire loading. When also the same concern put 31,500 pounds into a 50,000 pound capacity car, it were fully aware that the car was greatly underloaded. It is notorious that in the matter of loading cars, shippers are careless, and in many cases reckless in the extreme. It is probably true that railroads have been negligent on their part in the matter of grain shipments. Knowing that freight will be charged according to out turn weights, agents almost universally neglect to examine the loading of grain cars before leaving their stations. It might be well to require such an examination, and compel any deficiency or excess to be corrected by the shipper before the cars were allowed to be forwarded. It is true that such a rule would often delay the cars, but until shippers shall recognize their own responsibility in the matter something of this kind should be done.

HYDRAULIC RIVETING.

In considering the subject of the practical use of high pressure steam in a recent discussion of a paper before the Northwest Railway Club, several speakers referred to difficulties which had been experienced with high boiler pressures on account of imperfect workmanship in the construction of the boilers, which caused them to leak seriously from both longitudinal and circumferential seams. One of the members stated that this trouble was due to the fact that the riveting was not done by hydraulic riveting machines. Experience was described in the discussion unquestionably favoring hydraulic riveting, which was perhaps slower than air or steam work, but more satisfactory when finished. It is significant that some of the locomotive builders having the best reputations for boiler work have reverted to hydraulic riveting in place of steam or air, and the results appear to amply justify the change.

At the St. Louis meeting of the American Society of Mechanical Engineers of this year, the paper by Mr. H. F. J. Porter on steel forgings is interesting in this connection, because in it emphasis was laid upon the difference in effect between the steam hammer and the hydraulic forging press, upon the character of steel with particular reference in this instance to the manufacture of large steel shafts. The forging press makes itself felt through the whole forging instead of producing an effect upon the outside of the material through the velocity of the impact, as is the case with a steam hammer. This subject is closely allied to that of hydraulic riveting, and while exactly the same argument may not be used in favor of hydraulic riveting machines, the principle involved between the hammer and the press compares closely with that existing between a steam or air and a hydraulic riveting machine.

Sir Edward Harland remarked in 1894 before the Institution of Civil Engineers, upon the great improvement which had been attained in the quality of riveted work as the result of the recognition of the principle of applying pressure to the interior of the mass of metal worked upon. Formerly very light hammers were used in riveting, and these have given place to much heavier hammers, and this authority says that the best development of the principle was reached when hydraulic riveting was introduced. The secret of the improvement is that the work is improved when the center of the rivet is affected. The substitution of steady pressure in place of concussion is a step still further in the same direction. To show the difference between the effect of concussion and the act of steady pressure, a simple experiment may be tried, which consists of placing a cylinder of cold wrought iron upon the anvil of a steam hammer and giving it a number of blows. The result will be the feathering over of the faces of the cylinder. If a similar cylinder is placed in a hydraulic press the ends will not be affected but the center will bulge, which is conclusive proof of the fact that the press gets at the heart of things.

Mr. Coleman Sellers some time ago performed a series of experiments in this direction upon lead billets, which were cast from the same pig, showing the comparative effects of steam hammer blows and steady pressure in a hydraulic press, the comparison being made by measuring a billet after it had undergone a certain number of steam hammer blows and then ascertaining the pressure required to deform similar pieces to the same extent. The inch-pounds developed by the hammer and the pressure per square inch of the area of the billet which was required by the press were taken for comparison. With five blows reducing the billet to a length of five-eighth inch, the hammer developed 167,482 inch-pounds, and the equivalent pressure was 44,362 lbs., per square inch. The conclusion drawn from these experiments is that it takes less than one-third of the pressure to forge by compression between dies, of that which is required under the steam hammer in the case of lead and there seems to be no reason for thinking that the ratio will be far different in the case of iron.

If anything more than the trouble which has been experienced with air and steam riveted boilers, is needed to establish the advantage of hydraulic riveting, it may be found in the analogy between riveting and forging. Air and steam rivets permit of rapid work and while the pressure in these machines may be the same as those used in hydraulic work, in the former machines the motion of the plunger is practically a sudden blow, which it is natural to suppose, is accompanied by a rebound. Hydraulic riveting machines, however, are nothing short of forging presses in form and in action, and it is only fair to expect closer, stronger and more durable joints when made in this way.

It would undoubtedly have been far easier and cheaper to have employed steam riveters upon the Forth bridge, but such was the opinion of hydraulic riveting on the part of the engineers of that structure, that the plates which were put into the bridge were riveted up by small portable hydraulic machines, operating under a pressure of 1,000 lbs. per square inch. The established superiority of hydraulic work makes it seem advisable to raise the question as to whether it will not pay in the long run to put in the necessary hydraulic plant and perform such work upon the lines followed in the best of forging. As has been stated it has been found necessary in several locomotive building establishments in this country to substitute hydraulic for steam power, and the improvement which has been made in the quality of the work bears out the correctness of the proposition which has been made. For the same reason that hydraulic riveting is found to be better in boiler construction, it will probably be able to prove itself of equal value in car and truck construction. The ability to rivet up a truck bolster for a car or a tender in from three to five minutes, undoubtedly tells in first cost, but it is believed that even in such work as this, the superior quality of hydraulic riveting will pay in the long run. Elsewhere in this issue will be found quotations from letters recently received upon the subject of hydraulic riveting from officers of the two locomotive works to which reference has already been made.

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

The secretary of the American Society of Mechanical Engineers announces that the annual meeting will be opened at 9 p. m. on Tuesday evening, December 1, at the society's parlors, 12 West Thirty-first street, New York. The annual address by the president, Mr. John Fritz, whose term of office expires upon the adjournment of this convention will be given, and is entitled, "The Progress in the Manufacture of Iron and Steel in America, and the Relations of the Engineer to it."

On Wednesday morning, December 2, at 10 o'clock, the business session will be opened and reports of the council, tellers of finance and library committees, of professional committees on methods of tests, etc., will be received. "The Report of Progress from the Committee of Tests of Fire-proof Materials" will be presented at the Thursday evening session, to allow of its being illustrated by slides in the projection lantern.

Until the hour of adjournment after the executive business has been concluded professional papers will be taken up as follows:

the owner of grain in the building might recover from the railroad notwithstanding the lease.

In this country there is a vast amount of property annually destroyed by fire caused or set by sparks escaping from railway engines. In fact this danger is one of the greatest incidents to the operation of railroads. A fire is communicated to an elevator building, and oftentimes spreads from that, destroying a great deal of other valuable property—sometimes sweeping out of existence whole villages and towns, and causing conflagrations which run up into the millions. Because of these facts, railroad companies should be held to the highest possible degree of care. If, however, they are permitted to make contracts of the kind under consideration, they will not exercise any special care. The tendency of such a contract is to lessen the precautions taken because it relieves the railroad from the liability which would otherwise exist.

If the Supreme Court of the United States should hold that it is possible for a railroad to make a valid contract of this kind, at common law, then, in my judgment, it is highly important that in each and every state of the Union a law should be passed by the legislature of these states, to the effect that a railroad company should be liable for all damages by fire caused or set by it in the operation of its road, and without regard to negligence. The legislature has the same right to make this sort of a law as it has to regulate the rate of interest that should be charged and length of time that shall be required to bar a debt by the statute of limitations, and other statutes that might be named—all based on public policy. The state of Missouri has law of this sort, by which a railroad company is held liable for all damages by fire caused by it, whether it is guilty of negligence or not. This is right, because where one or two innocent persons must suffer, it should be that one by whose act the injury was brought about. If such were the law in all parts of the country, vast quantities of property would be saved from destruction by fire. Taxation would be correspondingly lighter the rate for insurance would be reduced, and the business of elevator and warehouse men would be promoted and made safer, and the interest of those who deposit for storage with them would be conserved.

A NEW DOUBLE CYLINDER FLOORING MACHINE.

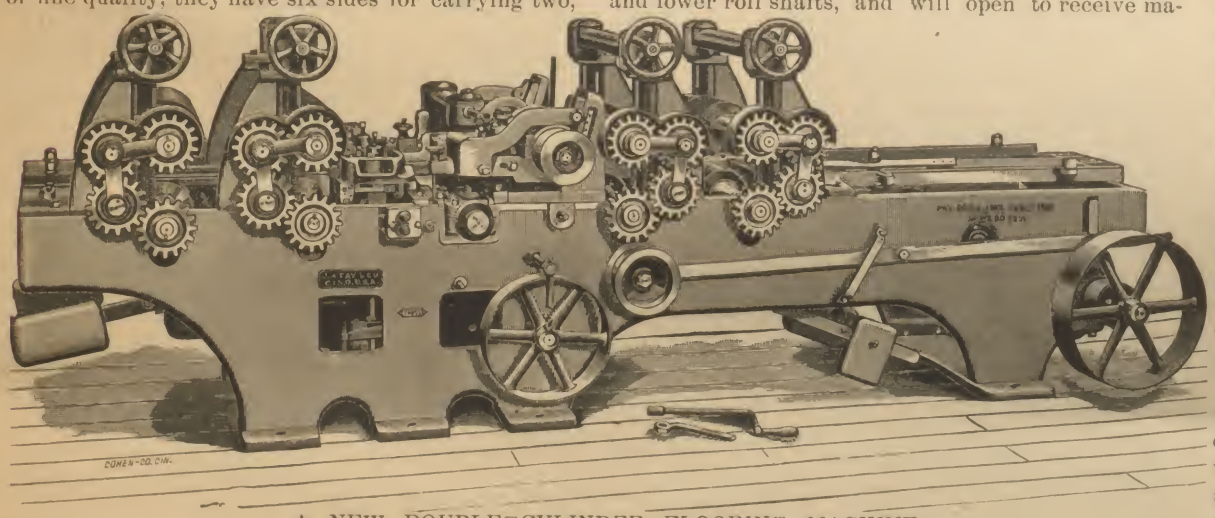
The accompanying engraving shows the general appearance of a new eight-roll double cylinder flooring machine which has recently been designed and placed upon the market by Messrs. J. A. Fay & Co., of 299 to 313 W. Front street, Cincinnati, O. The machine belongs to the type known as the "Lightning" flooring machines, and is specially arranged for such work as is found in car shops and large planing mills.

The cylinders are made from solid steel forgings, of fine quality, they have six sides for carrying two, four or six knives, as may be required, each side being furnished with a chip-breaking lip for working cross-grained lumber. The journals are 3 in. in diameter, lead ground, and run in exceptionally long and heavy bearings. Both cylinders are driven with two belts, each pulley having a taper bearing, aad secured by a wrought nut. The bearings of the upper cylinder are yoked together, and are placed on planed stands cast solid to a bedplate extending across the machine. These stands are fitted with a groove in which the bearings are bedded, and by them they are always retained in line. The lower cylinder is placed immediately beyond the upper one, thus bringing the material to an exact size before it is tongued and grooved, and bringing both top and bottom cuts as close together as possible when using bits on the cylinders for making two pieces of flooring from one board. This class of work was impractical on the old style of construction, because the lower cut was made too far away from the top cuting point, the tendency of the board to lead out of a straight line preventing the division of the board on the line of the top cut.

The automatic self-acting pressure bar in front of the cut of the upper cylinder on the feeding-in side is attached to arms which swing eccentrically to the periphery of the cylinder, insuring safety from contact with the cutters. The bar behind the cut of the upper cylinder adjusts itself vertically, and is self-acting in its operation. Both bars are adjustable to and from the cylinder to give room for different lengths of cutters required in making moldings, drop sidings, etc. The bed under the cylinder has a plate that can be detached for replaning or adjustment. As the lower cylinder is placed close to the upper cylinder, it permits of attaching the pressure bar over the lower cylinder, by swinging arms, to the upper cylinder frame, permitting it to rise and fall with the cylinder whenever the position of the latter is changed, thereby retaining its proper relation to the material, no matter what the cut may be. This bar has a separate vertical adjustment and a lock attachment for holding it in the proper position after once being set.

The matching works are of the most substantial character. The matcher spindles are 1¾ in. in diameter where the cutting heads are applied. They run in self-oiling bearings, and are adjustable independently or simultaneously across the bedplate to any desired point, so that the wear of the cutters may be equalized. The cutters have a vertical adjustment in the lower bearing to take up any wear in the spindles, and are provided with a lock attachment for holdibg them in position when once set. Unless otherwise provided for, a pair of four-wing gun metal matcher-heads fitted with a set of solid milled matching-cutters for standard flooring are furnished with the machine. Slotted jointing-heads and shimer flooring and ceiling-heads can also be furnished when required. An improved automatic weighted chip-breaker is applied to this machine. It is hinged to the match-hanger, and as the pressure is produced by a weight it is uniform at all times, whether the cut is heavy or light. It swings eccentrically from the cutters, and while it is arranged to work very close to the edge, it can never come in contact with the cutters.

The feed works are very powerful, consisting of eight rolls 8 in. in diameter, two pairs in front of the cut of the upper cylinder and two pairs behind the cut of the matcher heads. These carry the lumber entirely through and away from the cutters. They are mounted on planed upright stands fitted with pivoted boxes and connected by heavy expansion gearing. These gears have gun metal bushings and steel links on both sides, connecting with the upper and lower roll shafts, and will open to receive material 6 in. in thickness. The feed is controlled by a binder operated from the feeding end of the machine. The machine is made to work either 8, 15 or 18 in. in width to 6 in. in thickness, and is regularly supplied with pulleys for 62 and 80 ft. feed per minute.



A NEW DOUBLE CYLINDER FLOORING MACHINE.

CAR WHEELS FOR EXPRESS TRAINS IN EUROPE.

In the discussion of the report upon rolling stock for express trains, presented by Mr. Park, carriage superintendent of London & Northwestern Railway before the International Railway Congress, some interesting information was given in connection with the use of different types of wheels, under cars used in express service. The wheel used by the majority of British lines is that known as "Mansell's wood center" wheel, the details of which differ somewhat on various roads, but the general features are a cast iron hub which receives the smaller ends of segments of teak wood which form the body of the wheel, and the tire which is forced or shrunk upon this center where it is secured by the retaining rings which constitute a distinctive feature of the wheel and the form of which is well known. Before being put under the cars the wheels are carefully balanced on a specially designed machine to insure true running.

The subject of wheels was only a portion of the matter treated in the report by Mr. Park who took up also the arrangement of the interior of cars for various purposes and also the question of heating and lighting, a portion of the discussion upon the subject of lighting being given elsewhere in this issue. Mr. Ludvigh raised the question as to why wooden wheels had been adopted and whether they gave good satisfaction as to smooth running, and in this connection he also asked whether cars with trucks ran more smoothly than those without, and while his questions were not answered in detail, the president observed that there was a growing tendency to adopt the American pattern of cars with a long body in place of the four or six wheel cars which were in general use.

Mr. Frescot, of the Mediterranean Railway of Italy, pointed out the fact that while wheels with wooden centers could be used satisfactorily in England where easy gradients were the rule, they could not be used on the continent, where the grades are heavier, on account of the wearing and heating to which they were subjected by the friction of the brakes. This type of wheel had been tried in Italy, but after a short time they were given up on account of the wood catching fire. This experience was corroborated by Mr. Ely of the Pennsylvania Railroad, who stated that a great many Mansell wheels were imported some twenty years ago for use under sleeping cars, as they made less noise than cast iron wheels while running. They were tried on account of the marked success which they had shown in English practice. The difficulty with the brakes was also increased by the difference in the climate between summer and winter, the wooden wheels not being able to withstand alternate wetting and drying to which they were subjected in our wet winters and dry summers. They soon rattled and became useless, and gave place to paper or wrought iron for the centers. Owing to the severe application of brakes, the forms of wheels built up of a number of pieces were found to be much more expensive to maintain than simpler ones, and bolts, unless carefully fitted, were apt to work loose in their holes under the severe twisting action of the brakes. Mr. Antochine of the Russian State Railways and Mr. Kerbedz of the Vladicaucasus Railway also reported unsatisfactory experience with these wooden wheels, their failure in the two latter cases being due to the extreme dryness of the climate, which caused their rejection except in certain cases where brakes were not used. On the Imperial train, in the building of which elaborate pains were taken, there was no thought of using Mansell wheels, but iron wheels with steel tires and rims were selected.

It appeared from the discussion that Mansell wheels would not be accepted in interchange with other railways unless they had been overhauled within sixteen months and the date of their last inspection and overhauling was required to be stated upon the wheels.

Mr. Park, the reporter, replied to the observations which were made by the Russian engineers and Mr. Ely and defended the English practice of using Mansell wheels. In spite of the fact that there are some long grades in England where high speeds are used the Mansell wheel has so far been considered the wheel of that country. On the London & Northwestern Railway there were about forty thousand pairs of them in use with practically no difficulties, the good results being due to the temperature and even climate of that country. The whole discussion emphasized the fact that conditions varied in different countries to such an extent as to make it possible to use certain forms of construction under the climatic condition of certain localities which would not be practicable elsewhere, and the advantage as regards quiet and smooth running qualities of the Mansell wheel could not be enjoyed where the changes in temperature and humidity of the atmosphere were rapid or extensive. The discussion of the subject of wheels was confined chiefly to the one type referred to, and it is to be regretted that other important phases of the wheel question were not more generally considered.

Bessemer, Sir Henry. "An Historical and Technical Sketch of the Origin of the Bessemer Process."

Bonner, Wm. T. "Ancient Pompeian Boilers."

Kerr, C. V. "The Moment of Resistance."

Boyer, Francis H. "Work done daily by a Refrigerating Plant, and its Cost."

Thurston, R. H. "Promise and Potency of High Pressure Steam."

WEDNESDAY AFTERNOON.—This halfday, like the succeeding afternoons, is left without definite assignment. It has been found desirable for the New York Conventions not to fill the days so completely as to interfere with the individual convenience of the members in the matter of business appointments or pursuit of their own objects in the city. At 3 o'clock, an extra session has been arranged outside of the regular assignments, and in addition to them. It has been the desire of many friends and admirers of the late J. F. Holloway, past president of the society, that a sort of memorial session might be made such an extra feature of the convention, at which voice might be given to their respect and admiration for him, and for his work for the society. An address in the form of a memorial will be read, and short speeches will follow.

WEDNESDAY EVENING, December 2, 9 o'clock.—A reception and conversazione will be held for members and their ladies at Sherry's, 37th street and Fifth avenue. Dancing may be expected during the evening before supper, at the close of the officer's reception, and after supper as long as desired.

THURSDAY MORNING, December 3.—Professional papers will be read as follows:

Jones, F. R. and Goddard, A. L. "Experimental Investigation of the Cutting of Bevel Gears with Rotory Cutters."

Laird, J. A. "The Calibration of a Worthington Water Meter."

Schuman, Francis. "Contraction and Deflection of Iron Castings."

Seaver, John W. "A 200 foot Gantry Crane."

Schaefer, J. V. "Washing of Bituminous Coal by the Luhrig Process."

Benjamin, C. H. "Friction H. P. in Factories."

THURSDAY AFTERNOON—Is left like the other afternoons, without assignment, for visits by individuals or by small parties to points of professional interest in or near the city. Members will find cards of instruction at the rooms of the sooiety, which will give full transportation directions how to reach their objective point. Each establishment listed has a number to which a card of direction will correspond. Unless otherwise directed, excursion parties will leave the house at 2 p. m.

THURSDAY EVENING, December 3, 8:30 o'clock.—Professional papers will be read as follows:

Halsey, Fred'k A. "Some Special Forms of Mechanical Computers."

Wood, M. P. "Rustless Coatings for Iron and Steel."

Lane, H. M. "A Method of Shop Accounting to Determine Cost."

The session will conclude with an "Illustrated Presentation of the Report of Progress upon Tests of Fireproofing Material" by Mr. H. de B. Parsons, members of the society's committee on this subject.

FRIDAY MORNING, December 4, 10:30 o'clock.—Professional papers will be read as follows:

Christie, W. W. "The Efficiency of the Boiler Grate."

Hale, R. S. "Efficiency of Boiler Heating Surface."

Goss, W. F. M. "Paper Friction Wheels."

Ball, Frank H. "Steam Engine Governors."

Colles, Geo. W., Jr. "Metric vs. the Duodecimal System."

Waldo, Leonard. "Aluminum Bronze Seamless Tubing."

Waldo, Leonard. "The Photographing of Machinery."

Concluding business; adjournment.

The summer meeting of 1897 may be expected to be held in the City of Hartford, Conn.

The society has made arrangements upon the certificate plan by which members from a distance may obtain a return ticket from New York at one-third of the regular rates. In order to obtain the benefit of this arrangement it will be necessary for at least one hundred certificates to be presented at the meeting. Information with regard to this plan may be had by applying to the secretary, Prof. F. R. Hutton, 12 West Thirty-first street, New York.

LIABILITY RELEASE CLAUSE IN RAILROAD COMPANIES' GROUND LEASES.*

It is a fact that at nearly every station along the lines of railroads in the United States there is situated on the railroad's right of way, elevators and warehouses for the storage of grain. A nominal rent of from one to five dollars per annum is paid for leases of the ground covered by these buildings, and these leases are so drawn as to be practically perpetual as to the lessees, though subject to termination at any time at the option of the railroad company.

It is a great advantage to the railroads to have these buildings on their right of way, because they are thus given practically a monopoly of the carrying business connected with them, and thus also avoid, generally, the expense of building extra or additional tracks. The particular feature of these leases, however, which we are called on to consider is a clause contained therein by which the railroad company is, in advance, released from all liability for damages in case such buildings are destroyed by fire communicated from the engines of the railroad company, even though such fire be communicated by reason of the want of ordinary care, or by the gross negligence of the railroad company, its agents, servants or employes. It is not needful to quote to you the long and carefully drawn language of these leases by which all liability, under any possible circumstances, for fire, however communicated, is excluded. Some of you are doubtless familiar with this language from sad experiences, and others, I am sorry to say, will become familiar with it when a fire so caused occurs, sweeping out of existence in a few moments the accumulation of years, and you wake up to find that, on account of the language of these leases, you have no remedy against the wrong-doer who has thus destroyed your property.

What has already been done cannot well be changed, but for the future I would recommend that buildings be not erected on the right of way, until the lease covering the ground has been carefully examined and signed by both parties, and that no lease be entered into which contains a clause exempting the railroad company from liability for fire caused through its negligence. After the elevator or warehouse has been erected on the right of way, by consent of the railroad company, and before a lease has been signed, the owner is at the mercy of the railroad company, and is compelled to sign whatever is presented in the way of a lease, or else tear down and remove his buildings.

It is much better not to be upon the right of way of the railroad at all, than to be there under a lease of that kind. The low rental of from one to five dollars per year is in my opinion a mere subterfuge on the part of the railroad company to get the unwary owner onto the right of way so that this contract can be extorted. The great danger of fire from their engines is fully realized by the railroad company, but is not realized until too late by the owner, and hence the railroad, shrewd and far seeing, holding out the nominal rent of one to five dollars per year as an inducement, gets the owner onto the right of way, with a large amount of money invested in his buildings, andt hen presents to him the lease containing this clause, which he is then practically forced to sign, whether he likes it or not, and thus the railroad company has relieved itself of the great danger of liability for the destruction of the property by fire, and the owner in order to protect himself against the hazard, is usually compelled to pay to the insurance companies 50 cents per $100 on the amount insured on his building and contents, and sometimes finds it difficult to get protection even at such rates.

Where there is no lease of this kind, exempting the railroad company from liability, the owner can always, without any question, recover from the railroad the value of his property thus destroyed through the carelessness or negligence of the railway. If he has it insured under these circumstances, he has a double remedy—either against the insurance company under its policy, or against the railroad. If he pursues his remedy against the railroad company first, then having received one compensation in full, he cannot again collect from the insurance company. If, however, he pursues his remedy against the insurance company first, and thus get full compensation for the property destroyed, the insurance company on payment of a debt primarily owed to him by the railroad company, becomes possessed of his rights against the railrooad, and may sue and recover from the railroad the amount so paid the owner. This right the insurance company acquires under the well-known doctrine of subrogation, and the insurance company may sue the railroad company, either in its own name, or in the name of the owner, according to the local practice of the state in which the loss occurred. It will, therefore, be seen that the interests of the insurance company and the owner are identical, and whatever is against the interests of the assured or owner, so far as the lease is concerned, is against the interest also of the insurance company, because the insurance company, on payment, can be subrogated to those rights, and only those rights which the owner has at the time the fire occurs. If the owner has no right against the railroad, because of having executed the lease, then the insurance company acquires no rights against the wrong-doer by paying the loss. It is a fact, however, which should be thoroughly understood by the owner of such property, that if there is such a lease in existence as exempts the railroad company from liability for burning the property and notice of such lease is not given to the insurance company when the policy is obtained, the insurance company would not strictly be liable for the loss when it occurs, for the reason, that in the policy of insurance there is usually contained a clause substantially as follows: "If this company shall claim that the fire was caused by the act or negligence of any person or corporation, private or municipal, this company shall, on payment of the loss, be subrogated to the extent of such payment to all right of recovery by the insured for the loss resulting therefrom, and such right shall be assigned to this company by the insured on receiving such payment." This clause is as much a part of the insurance contract as is the clause which agrees to pay a loss, and if the assured owner, because of such lease, has rendered impossible for him to subrogate the insurance company, then he cannot make any valid assignment of the claim against the railroad, and because of such fact the insurance company would be relieved from liability under its policy. It is, therefore, important for the owner of a building on the right-of-way, first, not to make the lease, and second, if he does make the lease, to be sure and inform the insurance company of that fact when he procures the policy, and notice of the lease should be inserted in the written portion of the policy; and when the insurance company undertakes to carry the risk, with such knowledge, it is entitled to an additional rate, which is usually charged, because when a loss occurs it has not the usual right of subrogation for reimbursement against the wrongdoer causing the loss.

A railroad company should not be permitted to insert such a clause in its lease, and if such clause is inserted it should be treated by the courts as a nullity, as being against public policy and good morals, and should, under no circumstances, be enforced by the courts. No person should have the right to purchase, in advance, indemnity against his future wrongs or negligent conduct. It is an elementary principle of law and morals, that everyone should use his property so as not to injure the person or property of another. A railroad company should be held subject to this principle of law the same as every other person or institution. A railroad company being permitted by its charter to use fire in the operation of its engines, ought not, possibly, to be held for damages by fire accidentally caused because if it use the highest degree of care and skill in operating its engines and cars, and fires accidentally occur, it has been thought by the courts that no recovery shall be had in such cases, because there is no negligent use of its right, or faulty conduct in the operation of its business; but, at common law, whenever a fire is caused through the negligence or fault of a railroad company or other person, then always, from time immemorial, the person or institution causing such fire has been held liable in the absence of a lease of this sort. The lease operates to take away from the insured party the right which the law would otherwise give him. This particular clause of the lease is, therefore, contrary to the law, and should not be enforced. This clause is not germane to a lease. There is no adequate consideration to support it. It encourages negligence on the part of the railroad companies in operating their engines. Railroad companies should be held to the highest degree of care, and be required to use the best make of engines, equipped with the best well known appliances to prevent the escape of fire, and to be required to keep such appliances in good order, and operate their engines by the most competent and skillful persons; but if this lease operates to exempt the railroad company from liability for fires, then the tendency of enforcing this lease is to lessen the care and diligence of the railroad companies to prevent such fires.

Leases of this kind by railroad companies have been in existence for a long time, but only recently the question as to the legal validity of this exemption clause against fire has been raised in the courts.

On the 30th of April, 1890, sparks escaped from a locomotive engine and fell upon the elevator building of Mr. Griswold at Winthrop, Ia., and set fire to the roof and destroyed the building. The property was insured and the insurance money was paid amounting to some $6,000, which covered a part of Mr. Griswold's loss only. Subsequently Mr. Griswold and the insurance companies sued the railroad company to recover the full value of the property. The Illinois Central Railroad Company, who was the defendent, defended on the ground that it had a lease with Mr. Griswold by the terms of which the railroad company was released from liability, even though the property was destroyed through its negligence. The plaintiffs claimed in the case that the clause above referred to was invalid as being against public policy. The supreme court of Iowa, consisting of five judges, held that this clause of the lease was contrary to public policy and therefore void. All of the five judges concurred in this opinion. Subsequently, however, I am informed that the trunk lines of railway passing through Iowa uniting their forces, applied to the supreme court of Iowa for a rehearing of the case and upon rehearing three of the judges receded from their first opinion and two (Judge Robinson and Judge Kinney) adhered to the first opinion. This is the case of Griswold v. the Illinois Central Rd. Co., reported in the 53 Northwestern Reporter, page 295, and is the first case in the books questioning the validity of this clause.

Subsequently the case of Hartford Fire Insurance Co. against the Chicago, Milwaukee & St. Paul Railway Co. was commenced in Jones county, Iowa, to recover for the loss of a cold storage building destroyed by fire which was started by sparks from an engine falling upon the roof of the engine and setting fire to the same. This case was started while the first opinion of the supreme court of Iowa was yet in force, and it was removed, on application of the railroad company, from the state court to the United States circuit court sitting in Iowa. Subsequently the first opinion of the Griswold case was reversed by the three judges changing their views of the law, and on account of this change in the holding of the supreme court of Iowa, the United States circuit court, sitting in Iowa, considered itself bound by the decision of the three judges, and therefore held the clause of the railroad company valid, and defeated the plaintiffs. This case is entitled "Hartford Fire Insurance Co. and others vs. Chicago, Milwaukee & St. Paul Railway Co.," and is reported in the 62 Federal Reporter, page 904. An appeal was taken from this last decision to the circuit court of appeals of the United States, where the decision of the circuit judge was affirmed by a divided opinion. See 9th circuit court of appeals, page 659. This case has now been appealed to the supreme court of the United States at Washington, and is there pending, and a decision may may be expected, as I am informed, some time during the coming year. It is confidently believed by the attorneys acting on the behalf of the insurance companies in this case, from a ruling already made in the case of the supreme court at Washington, that that court will hold the exemption clause of the lease invalid, and it is sincerely hoped that such may be the result of the litigation.

There is one other case on this subject—that of Stevens vs. The Southern Pacific Railroad Company, 41 Pacific Reporter, page 783, in which it was first held that the lease was a valid contract, and relieved the railroad company from liability to the owner of the building, but that

*From a paper read by W. L. Barnum at the meeting of the Grain Dealers's National Association.

the owner of grain in the building might recover from the railroad notwithstanding the lease.

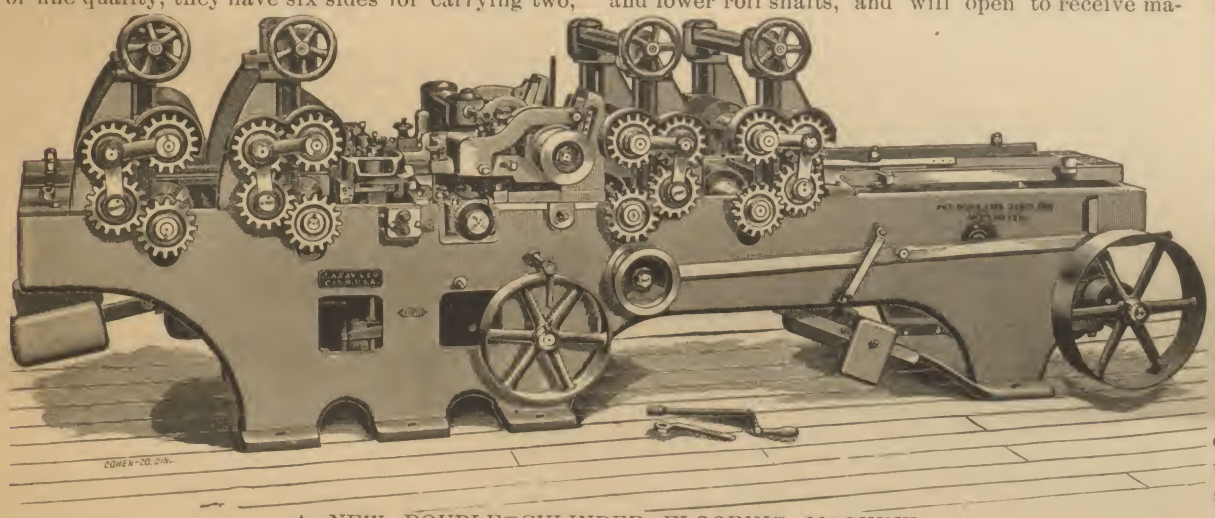
In this country there is a vast amount of property annually destroyed by fire caused or set by sparks escaping from railway engines. In fact this danger is one of the greatest incidents to the operation of railroads. A fire is communicated to an elevator building, and oftentimes spreads from that, destroying a great deal of other valuable property—sometimes sweeping out of existence whole villages and towns, and causing conflagrations which run up into the millions. Because of these facts, railroad companies should be held to the highest possible degree of care. If, however, they are permitted to make contracts of the kind under consideration, they will not exercise any special care. The tendency of such a contract is to lessen the precautions taken because it relieves the railroad from the liability which would otherwise exist.

If the Supreme Court of the United States should hold that it is possible for a railroad to make a valid contract of this kind, at common law, then, in my judgment, it is highly important that in each and every state of the Union a law should be passed by the legislature of these states, to the effect that a railroad company should be liable for all damages by fire caused or set by it in the operation of its road, and without regard to negligence. The legislature has the same right to make this sort of a law as it has to regulate the rate of interest that should be charged and length of time that shall be required to bar a debt by the statute of limitations, and other statutes that might be named—all based on public policy. The state of Missouri has law of this sort, by which a railroad company is held liable for all damages by fire caused by it, whether it is guilty of negligence or not. This is right, because where one or two innocent persons must suffer, it should be that one by whose act the injury was brought about. If such were the law in all parts of the country, vast quantities of property would be saved from destruction by fire. Taxation would be correspondingly lighter the rate for insurance would be reduced, and the business of elevator and warehouse men would be promoted and made safer, and the interest of those who deposit for storage with them would be conserved.

A NEW DOUBLE CYLINDER FLOORING MACHINE.

The accompanying engraving shows the general appearance of a new eight-roll double cylinder flooring machine which has recently been designed and placed upon the market by Messrs. J. A. Fay & Co., of 299 to 313 W. Front street, Cincinnati, O. The machine belongs to the type known as the "Lightning" flooring machines, and is specially arranged for such work as is found in car shops and large planing mills.

The cylinders are made from solid steel forgings, of fine quality, they have six sides for carrying two, four or six knives, as may be required, each side being furnished with a chip-breaking lip for working cross-grained lumber. The journals are 3 in. in diameter, lead ground, and run in exceptionally long and heavy bearings. Both cylinders are driven with two belts, each pulley having a taper bearing, aad secured by a wrought nut. The bearings of the upper cylinder are yoked together, and are placed on planed stands cast solid to a bedplate extending across the machine. These stands are fitted with a groove in which the bearings are bedded, and by them they are always retained in line. The lower cylinder is placed immediately beyond the upper one, thus bringing the material to an exact size before it is tongued and grooved, and bringing both top and bottom cuts as close together as possible when using bits on the cylinders for making two pieces of flooring from one board. This class of work was impractical on the old style of construction, because the lower cut was made too far away from the top cutting point, the tendency of the board to lead out of a straight line preventing the division of the board on the line of the top cut.



A NEW DOUBLE CYLINDER FLOORING MACHINE.

The automatic self-acting pressure bar in front of the cut of the upper cylinder on the feeding-in side is attached to arms which swing eccentrically to the periphery of the cylinder, insuring safety from contact with the cutters. The bar behind the cut of the upper cylinder adjusts itself vertically, and is self-acting in its operation. Both bars are adjustable to and from the cylinder to give room for different lengths of cutters required in making moldings, drop sidings, etc. The bed under the cylinder has a plate that can be detached for replaning or adjustment. As the lower cylinder is placed close to the upper cylinder, it permits of attaching the pressure bar over the lower cylinder, by swinging arms, to the upper cylinder frame, permitting it to rise and fall with the cylinder whenever the position of the latter is changed, thereby retaining its proper relation to the material, no matter what the cut may be. This bar has a separate vertical adjustment and a lock attachment for holding it in the proper position after once being set.

The matching works are of the most substantial character. The matcher spindles are 1¾ in. in diameter where the cutting heads are applied. They run in self-oiling bearings, and are adjustable independently or simultaneously across the bedplate to any desired point, so that the wear of the cutters may be equalized. The cutters have a vertical adjustment in the lower bearing to take up any wear in the spindles, and are provided with a lock attachment for holdibg them in position when once set. Unless otherwise provided for, a pair of four-wing gun metal matcher-heads fitted with a set of solid milled matching-cutters for standard flooring are furnished with the machine. Slotted jointing-heads and shimer flooring and ceiling-heads can also be furnished when required. An improved automatic weighted chip-breaker is applied to this machine. It is hinged to the match-hanger, and as the pressure is produced by a weight it is uniform at all times, whether the cut is heavy or light. It swings eccentrically from the cutters, and while it is arranged to work very close to the edge, it can never come in contact with the cutters.

The feed works are very powerful, consisting of eight rolls 8 in. in diameter, two pairs in front of the cut of the upper cylinder and two pairs behind the cut of the matcher heads. These carry the lumber entirely through and away from the cutters. They are mounted on planed upright stands fitted with pivoted boxes and connected by heavy expansion gearing. These gears have gun metal bushings and steel links on both sides, connecting with the upper and lower roll shafts, and will open to receive material 6 in. in thickness. The feed is controlled by a binder operated from the feeding end of the machine. The machine is made to work either 8, 15 or 18 in. in width to 6 in. in thickness, and is regularly supplied with pulleys for 62 and 80 ft. feed per minute.

CAR WHEELS FOR EXPRESS TRAINS IN EUROPE.

In the discussion of the report upon rolling stock for express trains, presented by Mr. Park, carriage superintendent of London & Northwestern Railway before the International Railway Congress, some interesting information was given in connection with the use of different types of wheels, under cars used in express service. The wheel used by the majority of British lines is that known as "Mansell's wood center" wheel, the details of which differ somewhat on various roads, but the general features are a cast iron hub which receives the smaller ends of segments of teak wood which form the body of the wheel, and the tire which is forced or shrunk upon this center where it is secured by the retaining rings which constitute a distinctive feature of the wheel and the form of which is well known. Before being put under the cars the wheels are carefully balanced on a specially designed machine to insure true running.

The subject of wheels was only a portion of the matter treated in the report by Mr. Park who took up also the arrangement of the interior of cars for various purposes and also the question of heating and lighting, a portion of the discussion upon the subject of lighting being given elsewhere in this issue. Mr. Ludvigh raised the question as to why wooden wheels had been adopted and whether they gave good satisfaction as to smooth running, and in this connection he also asked whether cars with trucks ran more smoothly than those without, and while his questions were not answered in detail, the president observed that there was a growing tendency to adopt the American pattern of cars with a long body in place of the four or six wheel cars which were in general use.

Mr. Frescot, of the Mediterranean Railway of Italy, pointed out the fact that while wheels with wooden centers could be used satisfactorily in England where easy gradients were the rule, they could not be used on the continent, where the grades are heavier, on account of the wearing and heating to which they were subjected by the friction of the brakes. This type of wheel had been tried in Italy, but after a short time they were given up on account of the wood catching fire. This experience was corroborated by Mr. Ely of the Pennsylvania Railroad, who stated that a great many Mansell wheels were imported some twenty years ago for use under sleeping cars, as they made less noise than cast iron wheels while running. They were tried on account of the marked success which they had shown in English practice. The difficulty with the brakes was also increased by the difference in the climate between summer and winter, the wooden wheels not being able to withstand alternate wetting and drying to which they were subjected in our wet winters and dry summers. They soon rattled and became useless, and gave place to paper or wrought iron for the centers. Owing to the severe application of brakes, the forms of wheels built up of a number of pieces were found to be much more expensive to maintain than simpler ones, and bolts, unless carefully fitted, were apt to work loose in their holes under the severe twisting action of the brakes. Mr. Antochine of the Russian State Railways and Mr. Kerbedz of the Vladicaucasus Railway also reported unsatisfactory experience with these wooden wheels, their failure in the two latter cases being due to the extreme dryness of the climate, which caused their rejection except in certain cases where brakes were not used. On the Imperial train, in the building of which elaborate pains were taken, there was no thought of using Mansell wheels, but iron wheels with steel tires and rims were selected.

It appeared from the discussion that Mansell wheels would not be accepted in interchange with other railways unless they had been overhauled within sixteen months and the date of their last inspection and overhauling was required to be stated upon the wheels.

Mr. Park, the reporter, replied to the observations which were made by the Russian engineers and Mr. Ely and defended the English practice of using Mansell wheels. In spite of the fact that there are some long grades in England where high speeds are used the Mansell wheel has so far been considered the wheel of that country. On the London & Northwestern Railway there were about forty thousand pairs of them in use with practically no difficulties, the good results being due to the temperature and even climate of that country. The whole discussion emphasized the fact that conditions varied in different countries to such an extent as to make it possible to use certain forms of construction under the climatic condition of certain localities which would not be practicable elsewhere, and the advantage as regards quiet and smooth running qualities of the Mansell wheel could not be enjoyed where the changes in temperature and humidity of the atmosphere were rapid or extensive. The discussion of the subject of wheels was confined chiefly to the one type referred to, and it is to be regretted that other important phases of the wheel question were not more generally considered.

TECHNICAL MEETINGS.

The annual convention of the American Society of Mechanical Engineers will be held at the house of the society 12 West Thirty-first street, New York City, December 1st to 4th, 1896. Secretary, F. R. Hutton.

The Engineers' Club of Cincinnati has a monthly meeting on the third Thursday in each month, at 7:30 p. m. at he Literary Club, 24 West Fourth street, Cincinnati, O. Address P. O. Box 333.

The Engineers' Club of Minneapolis holds its meetings on the first Thursday in each month, at Public Library building, Minneapolis, Minn.

The Engineers' Club of Philadelphia meets on the first and third Saturdays in each month, at 8 p. m., at the house of the club, 1122 Girard street, Philadelphia, Pa.

The Civil Engineers' Club of Cleveland, meets on the second and fourth Tuesdays in each month, at 8 p. m., at the Case Library building, Cleveland, Ohio.

The Association of Engineers of Virginia, holds its in formal meetings on the third Wednesday of each month from September to May inclusive, at 8 p. m., at 710 Terry building, Roanoke, Va.

The Western Railway Club of Chicago, holds its meeting on the third Tuesday of each month.

The Central Railway Club meets on the second Friday of January, March, May, September and October, at 2 p. m., at the Hotel Iroquois, Buffalo, N. Y.

The Denver Society of Civil Engineers meets on the second and fourth Tuesdays in each month except July, August and December, when they are held on the second Tuesday only, at 36 Jacobson building, Denver, Colo.

The Western Society of Engineers holds its regular meetings for the transaction of business and the reading and discussion of papers on the first Wednesday of each month except January.

The American Society of Civil Engineers holds meetings on the first and third Wednesdays in each month, at 8 p.m., at the House of the Society, 127 East Twenty-third street New York City.

The Association of Civil Engineers of Cornell University meets weekly every Friday, from October to May inclusive, at 2:30 p. m., at Lincoln Hall, New York.

The Boston Society of Civil Engineers, meets monthly on the third Wednesday in each month, at 7:30 p. m., at Wesleyan Hall, 36 Bromfield street, Boston, Mass.

The Canadian Society of Civil Engineers meets every other Thursday at 8 p. m., at 112 Mansfield street, Montreal, P. Q.

The Foundrymen's Association meets monthly on the first Wednesday of each month, at the Manufacturers' Club, Philadelphia, Pa.

The Montana Society of Civil Engineers meets monthly on the third Saturday in each mouth, at 7:30 p. m., at Helena, Mont.

The New England Railroad Club meets on the second Tuesday of each month, at Wesleyan Hall, Bromfield street, Boston, Mass.

The New York Railroad Club has a monthly meeting on the third Thursday in each month, at 8 p. m., at 12 West hirty-first street, New York City.

The Northwestern Track and Bridge Association meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m., at the St. Paul Union Station, St. Paul, Minn.

North-West Railway Club meets alternately at the West Hotel, Minneapolis, and the Ryan House, St. Paul, on the second Tuesday of each month.

The Engineering Association of the South meets on the second Thursday of each month at 8 p. m., at the Cumber and Publishing House, Nashville, Tenn.

The Railway Signaling Club holds its meetings in Chicago, Ill., on the second Tuesday of January, March, May, September and November. G. M. Basford, secretary, 818 The Rookery.

The Southern & Southwestern Railway Club holds its meetings on the third Thursday of January, April, August and November, at the Kimball House, Atlanta, Ga.

The Western Foundrymen's Association holds its meetings on the third Wednesday in each month, at the Great Northern Hotel, Chicago, Ill.; secretary, A. Sorge, Jr., 1533 Marquette building.

The resignation of Mr. B. W. Appleton as general reight and passenger agent of the Unadilla Valley road has been announced.

Mr. J. Stanley Orr has accepted the position of traveling passenger agent of the Southern Pacific at Cincinnati to succeed Mr. C. C. Henion.

PERSONAL.

Mr. Volney T. Mallott of Indianapolis, Ind., has been appointed receiver for the Vandalia Lines, under a bond of $50,000.

Mr. T. H. Russom has been appointed general car foreman of the Mt. Clare shops, B. & O., vice Mr. C. H. Williams, resigned.

Mr. P. F. Smith has been appointed master mechanic of the Pittsburgh, Ft. Wayne & Chicago shops at Crestline, O., vice Mr. G. F. Sweeley, transferred.

The receivership of Messrs. McHenry and Bigelow over the Northern Pacific Railroad was formerly terminated by Judge Jenkins at Milwaukee on the 17th inst.

The Hon. S. A. Beardsley, railroad commissioner o New York, has tendered his resignation, to become effective December 29, one month before his term expires by law.

The successor of the late Col. William Edmond as personal claim agent of the Houston & Texas Central, has just been appointed. He is Mr. William Douglass Herring, and his residence is Waco.

Mr. Gaunt Crebs has been appointed receiver for the Middle Tennessee & Alabama road, upon application of the New York Trust Co. This step was taken in order to reorganize and complete the road.

Mr. George Ingalls has been appointed assistant to the president of the Chesapeake & Ohio. Mr. Ingalls is 25 years of age, a graduate of Harvard, and a promising railroad man. He is son of President Ingalls.

Mr. James A. Davis has been appointed industrial commissioner of the Santa Fe. His duties will be to look after the various industries owned by the road, they being separated from the management of the main property.

Mr. Walter De Sanno has been appointed master mechanic of the Chicago & Southeastern, vice Mr. J. W. Roberts, resigned. Mr. De Sanno comes from the Panhandle lines, and will have charge of repairs of the entire rolling stock.

Mr. W. T. Fisher, of St Louis, has been appointed traveling accountant of the Missouri Pacific, with headquarters at Sedalia. Mr. Simon Cronin, whom Mr. Fisher succeeds, has accepted the position of cashier of a bank at California, Mo.

Mr. C. H. Spencer has been appointed assistant general manager of the Quincy, Omaha & Kansas City, and will be particularly intrusted with the purchasing of material and supplies. Mr. C. E. Soule having resigned as superintendent, that office is abolished.

General Claims Agent Thomas Flynn, of the Grand Trunk west of the St. Clair River, has resigned, having secured other employment in Canada, near his old home. The company, in a letter to Mr. Flynn, regrets his loss after 28 years of faithful service

Mr. W. W. Webster, soliciting freight agent of the Chicago, Burlington & Quincy, has resigned and has been appointed traveling agent for the Star-Union line, with headquarters at Kansas City. Mr. G. M. Pettit will fill the vacated position on the Burlington.

Mr. Charles L. Hopkins, for the past several years traveling passenger agent of the Southern Railway, with headquarters at Charlotte, has been appointed Pacific Coast passenger agent of the Piedmont Air Line, and will be located hereafter in San Francisco.

Mr. James McCrea, Jr., son of First Vice President McCrea of the Pennsylvania Co., on the first of next month becomes engineer of maintenance of way of the Indianapolis & Vincennes. Mr. McCrea, Jr., is a graduate of Yale College, and will no doubt make his mark in the railroad world.

Mr. F. W. Hovey, who for the past two years has acted as treasurer of the Sebasticook & Moosehead road, has tendered his resignation to the directors of that road. The position of treasurer will be filled by President Z. D. Lancaster until the next annual meeting of the stockholders, which will occur in July, 1897.

Mr. E. H. Hinton has been unanimously elected by the executive board of the Southwestern Traffic Association to succeed Mr. J. Waldo as member of the board of administration. Mr. Hinton is at present general agent for the Panama Railway at San Francisco and was formerly general freight agent of the Texas & Pacific Railway.

Col. S. G. Eddy, a pioneer railway man of the Southwest and ex-general superintendent of the Choctaw, Oklahoma & Gulf Railway, has been stricken with paralysis at Denison, Tex., and is not expected to live. Colonel Eddy, was division superintendent of the Missouri Kansas & Texas Railway when the line was completed to Texas in 1873.

Mr. Steve Gano, Jr., has been appointed soliciting agent of the Grand Rapids & Indiana road, with headquarters at St. Louis. He succeeds Mr. F. P. Everhard, who resigned to engage in mercantile pursuits. Mr. Gano was formerly with the Union Pacific, but more recently has been with the Addyston Pipe & Steel Co. as traffic manager.

Mr. W. Bankes, who has filled the position of secretary to Mr. J. D. Rahner, assistant general passenger agent of the Florida East Coast Railroad, has been appointed private secretary to Mr. J. P. Beckwith, traffic passenger manager of the system. Mr. S. S. Satchwell, of Wilmington, N. C., has been appointed to fill the position made vacant by Mr. Bankes' promotion.

Mr. J. W. Cutler, formerly general southern agent of the Chicago & Eastern Illinois and Evansville & Terre Haute Railroads, with headquarters at Atlanta, Ga., has resigned that position to accept the post of general freight agent of the Georgia Southern & Florida road, with headquarters at Atlanta, succeeding Mr. R. G. Stone, resigned. Mr Cutler was formerly an agent of the Mallory Steamship Company.

Mr. J. S. Leahy has been appointed general southern agent of the Cincinnati, Hamilton & Dayton, with headquarters at Cincinnati, in charge of business originating in Cincinnati, south of the Ohio river and east of the Mississippi river. Mr. J. R. McGregor has been appointed traveling passenger agent, and Mr. Perry Griffin northwestern passenger agent, with headquarters in Chicago.

Mr. Thomas Stoddart, claim agent of the St. Paul & Duluth, died Nov. 17 at St. Paul. Mr. Stoddart was one of the most widely and favorably known men in the railroad business in the northwest. He was claim agent of the St. Paul & Duluth six years, before which time he was in the general freight office of the Iowa Central at Marshalltown. Before that he was in the grain business.

Mr. Frederick M. Wann, of St. Louis, assistant general freight agent of the Chicago & Alton, has been appointed general freight agent of the same road, in place of Mr. H. H. Courtright, who resigned to accept membership in the board of administration of the Western Freight Association. Mr. George S. Tyler, general agent at St. Louis, will succeed Mr. Wann as assistant general freight agent.

Mr. Andrew Stevenson, commercial freight agent of the Baltimore & Ohio Railroad in Baltimore, will be appointed division freight agent of the road on December 1. The office is a new one, as the road has never had such an official there. Mr. Stevenson's headquarters will probably remain in Baltimore. He was formerly with the Cleveland, Cincinnati, Chicago & St. Louis Railway, and accepted an appointment with the Baltimore & Ohio less than a year ago.

Mr. H. H. Richardson, contracting agent Nashville, Chattanooga & St. Louis Railway, and Western & Atlantic Railroad at Birmingham has tendered his resignation, to take effect Dec. 1. Mr. Richardson has just received his appointment as general Florida agent of the Georgia Southern of Florida Railroad. He was three years with the Orange Belt Railway as secretary of the company, and five years in his present position. Mr. Richardson's successor will be named in a few days.

In an official circular General Passenger Agent Keenan of the Gulf, Colorado & Santa Fe announces the appointment of J. P. Wright as traveling passenger agent of the company, vice W. A. Tuley recently resigned. Mr. Wright's appointment is a promotion as he is at present agent for the company at Cleburne. Also the appointment of S. A. Kendig to succeed William Doherty as passenger agent and traveling passenger agent at Fort Worth. Mr. Kendig has been the agent of the company at Gainesville.

According to official announcement a number of changes have been made on the Baltimore & Ohio road among which are the following: Mr. J. E. Spurrier, superintendent of the Baltimore division, will hereafter have charge of the first division, including Brunswick Yard, Curtis Bay, Washington, Alexandria, Metropolitan and Frederick branches, and Washington Co., Railroad. Mr. F. A. Husted has been appointed superintendent of the second and third divisions, including the Berkeley Springs and Potomac and South Branch Railroads, which will hereafter be known as the middle division. Mr. R. M. Sheats, superintendent Parkersburg (Wheeling division) will have charge of the fourth and fifth divisions, including Grafton Yard and Grafton and Belington division.

Col. W. M. Liggett has handed in his resignation as a member of the Minnesota state railroad and warehouse commission, to take immediate effect. Col. Liggett was recently elected dean of the agricultural college and the resignation of the railroad commissionership was tendered to allow him to assume the duties of the new position. He was appointed a member of the railroad and warehouse commission in January, 1891, by Gov. Merriam, and reappointed by Gov. Nelson in 1894. His term would have expired in January next. The resignation was at once accepted and Hon. Nathan C. Kingsley of Austin has been appointed to fill the vacancy. Mr. Kingsley is considered one of the best known and ablest attorneys of Southern Minnesota.

Mr. James M. Egan, one of the best known railroad officials in the west, has been elected vice president and general manager of the Central of Georgia Railroad. Mr. Egan leaves the position of general manager of the Lake Superior & Ishpeming road in northern Michigan. He first entered railway service as an apprentice boy in 1863 and his first position of importance was that of chief engineer of the Southern Minnesota in 1877 where he remained nearly five years. For four years following he was general superintendent of the Canadian Pacific's Western division, and in September 1886, he was appointed general superintendent of the St. Paul, Minneapolis & Manitoba road. He went to the Chicago Great Western as general manager in February 1888, and held that position two years when he was elected president. He left that position in 1894. Mr. Egan is regarded as a very able operating official. He was prominently identified with the General Managers' Association in Chicago during the big strike, and the fact that he has been selected for the management of the reorganized Georgia Central is another evidence of official determination to bring western methods into Southern railroad management. Mr. Egan was also elected a director in the company, and his headquarters will be in Savannah. He will immediately enter upon his new duties.

RAILWAY NEWS.

Astoria & Columbia River.—The new line building between Astoria and Goble in Oregon is fast nearing completion and will tap the largest spruce belt in the webfoot state, a matter of more importance than appears upon the surface. A good deal of spruce is used in the Missouri river territory, being sold as white pine, and much of it comes from Gray's Harbor. Therefore the new road may cut into the latter trade to some extent, but the demand is growing, and there will be trade for all. The Union Pacific will probably absorb the local rate through the Ore-